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Contributions.

Handling Freight Trains with Air Brakes.

RUTLAND, Vt., Oct. 10, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Being a practical locomotive engineer, and having had considerable experience with air-braked freight trains, while in that capacity, and also since, I cannot agree with the practice as set forth by "W. S. S." in last week's issue of the *Railroad Gazette*, in regard to using a limited number of air brakes when more are available, and the use of hand brakes on the rear end of a freight train to assist in holding or stopping a train partially equipped with air brakes. Instances have come under my notice where damage to merchandise and stock and other lading, and accidents from breaking in two and the two sections of the train colliding, could have been averted had all available air brakes in the train been used. I have also seen the evils of using hand brakes on the rear end of a partially equipped air brake train, and trust, in writing this, that some one may be saved the necessity of going through this disastrous experiment.

The answers given by the engineers and conductors of whom this canvass was made, are doubtless true of the practices used in handling air-braked trains in that particular section of the country, but are not in accordance with recognized practice on well regulated and successful air-brake roads elsewhere.

The practice of using a limited number of air brakes, regardless of other available ones, originated some years ago, when less was known about handling air-braked trains than now, and the automatic equalizing feature of the engineers' brake valve had not yet been invented, and unless extreme care was used the hand brakes would release after being applied. Intelligent instruction and improved apparatus have dispelled these objections, and made the handling of any number of air brakes on a long train an easy matter for the average engineer, where previously it was only accomplished by the careful and skilful man. It is to be regretted that some have acquired the practice as a habit, and are not yet out of the rut.

On the far Western roads we find every available air brake cut in and working, regardless of the number, unless defective. The fact that all air brakes may be advantageously worked on long trains has been demonstrated by orders having been issued by a number of these lines, requiring all cars to be braked and in working order before they shall be received, thus giving a continuous automatic brake from the pilot of the engine to the rear of the caboose. Here we also find an admirable system of air brake defect card used, whereby a brake is reported as soon as a defect develops, and it is at once put in condition for service. Instances have come under my notice, where trainmen on these roads will work with the brakes while the train is on a side track, taking up slack, tightening up leaky joints in the train pipes and connections, and in other ways nursing and doctoring up a poor brake that it may be worked down the mountain. I have also seen trainmen doing this work on a Western road, and on a level division, too, when the thermometer ranged 15 degrees below zero. Surely these practical men would not do this if there were no advantage to be had from adding another air brake to an already long train.

The automatic feature of the air brake, and its reliability in controlling trains on mountain grades is what recommends its use there. If "anything were to happen to the air," that something would apply the brakes with a promptness and force which a double or triple crew could not rival, and would stop the train while a train crew would be getting ready. Should the pressure be low at the moment of "something happening," from recent application, the brakes will set with reduced force, but the hand brakes are still available, and their efficiency may be added to that already given the brakes by the piston pressure.

When desiring to stop at a water tank on a descending grade, and it would be impossible to back up in case a miscalculation in stopping would cause the engine to go by, it would be advisable to make the stop a few feet back, and cut the engine off, if the engineer lacked the confidence or skill to make it with the train.

On a level road, the gradual control of the slack of the train and smoother handling in consequence, thus preventing damage to merchandise and stock from shock, and the decreased liability of collision were the train to part, to say nothing of the good condition the brakes are being kept in by constant operation, is sufficient argument in favor of switching all air cars ahead, and using them. Many roads have bulletin orders requiring such to be done in all yards, yet there are some few where road men are deprived the use of the air brakes because the issuance of such an order has been neglected. Air brakes on freight trains have made higher speed possible. The greater the number of air brakes there are in a train, the shorter the stop that can be made, hence, the greater is the safety of the train, should an emergency demand an unusually quick and short stop. How common is the saying of the engineer, who has had a rear or head end collision, "If I had had but fifty feet more to stop in, I wouldn't have struck him."

Making water-tank and other patricular stops with a 40-car air-braked train on a level road resembles greatly that with a long passenger train, and is a matter which causes no uneasiness to an engineer with a reasonable amount of skill. If, through miscalculation, the train should be seen to be stopping short of the desired point, a little steam used while brakes are yet set will allow him to gain quite a number of feet. Should the train be stopped a few feet from the place desired, "kicking" off a few of the head brakes will permit the slack of the draft gear and couplings to be utilized, and the point may be reached by using a little steam gently. Brakes, however, should never be "kicked" off on a moving freight train. It is erroneously believed by some engineers not yet out of the rut, that the difficulty in stopping an air-brake train at a given point increases in the same ratio as the number of brakes in the train.

It is a matter of air-brake history, that all roads equipping with freight brakes have a costly and disagreeable experience in passing through that stage where a part of the train is equipped with air brakes, and the other portion is not, unless they have previously learned to shun the use of hand brakes on the rear end of the train to assist the air brakes. Should the air brakes in the train be insufficient to control it, the hand brakes immediately in the rear of the air brakes should be used, when it will be found that the trouble referred to will have disappeared entirely. On roads where knolls and sags are common, the plan of using hand brakes on the rear end of train to assist the air brakes, commands prominent attention from the amount of damage it causes to the draft rigging; also damage done from breaking in two and colliding. When a train is broken from improper use of hand brakes on the rear end, it usually parts in the non-air cars. Leave the hand brakes alone on the rear end unless backing up, and use those immediately back of the air cars, and this plan will be justified by the decreased number of draw heads pulled out and broken, proving thereby that a partially equipped train may be as smoothly handled as one wholly equipped with air brakes.

When the train is partially equipped with air brakes, the engineer should apply his brakes lightly, wait until the slack bunches, which will manifest itself by a crowding ahead sensation; then he can apply such braking force as the occasion demands. This will prevent the men in the caboose from being roughly handled, and the shock caused by a reckless engineer applying with too great force will not cause the damage usually given to the lading. A reckless application presents a "stone wall" for the slack to run into, and provokes the train crew to exercise some means (usually resort to the rear hand brakes) to save themselves from this disastrous shock, in which case the shock is not felt when brakes are applied, but when the slack runs out, instead. At this time is when the expected break in two is liable to occur, for, as the slack runs out car by car, it eventually brings up at that point where the hand brake is set, and has the same effect on the couplings as that of making taut a long rope with an anchor attached. Instruct the engineer how necessary it is to apply the brakes lightly at first until the slack bunches, and the caboose will not collide with the "stone wall." Have brakemen shun the use of rear hand brakes, and their caboose will not be "anchored."

While perfectly tight air-brake trains are very desirable, they are very difficult to find. A train which will allow the pump governor to occasionally manifest its presence and utility, is considered by good air-brake engineers as a good train. But in instances where the pump must race to its utmost speed to maintain the standard pressure of 70 pounds, because of leakage in the train, it is considered better practice to be content with a lower effective pressure, say 50 or 60 pounds, as the higher the pressure carried, the greater the amount lost through leakage, and the faster the pump will be obliged to run. This amount will be sufficient to ordinarily control a train, and I have known instances where freight trains have been dropped down very heavy mountain grades with this low pressure, all cars, however, being air-braked. I would not imply that 50 or 60 pounds is all the pressure necessary to hold trains on mountain grades, but merely give this as an illustration of what can be done under difficulties.

F. M. NELLIS.

American Society of Railroad Superintendents.

The twenty-fourth meeting of this society was held in New York City, on Monday of this week, about 40 members being present. President George W. Beach, of the Naugatuck Division of the New York, New Haven & Hartford, presided.

Mr. Beach introduced Mr. Willard A. Smith, of the *Railway Review*, Chicago, who delivered an address on Railroad Education. The speaker made a general survey of all the of rkinds of education needed for the prosperity of railroads and their employees. He vigorously condemned the various attempts to reform society by wholesale. The only way to reform large bodies of persons is to reform the individuals. Referring to the duty of railroad men to educate the public he suggested that the money now spent in trying to influence legislatures might well be used to conduct a campaign of education. In the railroad service itself, education is needed in all departments, high and low. In the traffic department it is to be hoped that when Congress authorizes pooling and thus permits a resort to rational methods, the men of the traffic department will rapidly educate themselves in a more effective manner than is now possible. In the mechanical department, while invention opens out a wide field of possibilities, we have much to do to bring present mediocre men and machines up to the highest standard. Educate the men to make better use of the knowledge already available. Much good is to be expected from the cooperation of railroads and technical schools. Railroad officers should give much more time and attention to the education of employees. There is a field for a special periodical literature in this direction. Instrumentalities now used are insufficient. The Young Men's Christian Association affords good moral training as far as it goes, but is subject to limitations, prominent among which is the fact that many railroad men are affiliated with a church which does not sympathize with the Association. The demagogue and agitator are constantly putting themselves in close contact with the rank and file of railroad men. Railroad officers should see that good influences are equally well applied, and must teach the employees in the line of high moral principles not only by precept, but by example.

The report of the Executive Committee showed a balance of \$1,647 in the treasury. The proposition to hold regular meetings semi-annually was lost. The by-laws were amended so that the election of officers will be the last business at each meeting; and a new article was added providing for a Reception Committee to promote good fellowship at the meetings.

The Secretary's report showed a membership of about 250; and 12 active, two associate and five honorary members were elected. The Secretary reported that he had supplied the Train Rule Catechism to members and had sold a considerable number of copies. In closing his report he urged the members to give more attention to contributing the results of their experience to the Association in the shape of written papers, even if very brief.

The only papers presented by members at this meeting were one on Rules for the Government of Trackmen, by Seely Dunn, Division Superintendent on the Louisville & Nashville, and a short one by Mr. C. C. Anthony on details of signaling. Mr. Dunn's paper presented a carefully prepared catechism for the examination of section foremen on the Louisville & Nashville. It consists of 295 questions and answers. More than half of these concern details of repair and construction. The rest, more particularly referring to train rules and kindred matters, afford an interesting study in comparison with catechisms for trainmen, with which the members of the Superintendents' Society are doubtless more familiar. We suspect that many valuable hints as to the best construction of answers may be here found which would be of benefit to makers of trainmen's catechisms. Mr. Anthony, in his paper, cites numerous instances of inconsistency in signaling diverging routes. Where a branch railroad, traversed by passenger trains at considerable speed, and a side track to be traversed at very low speed, diverge from the main line at or near the same point, the signals are so arranged as to leave the engineman in doubt. Recognizing the propriety of always having the top arm indicate for the main route, Mr. Anthony holds that there is no necessity for the limit of two arms to a post. There is no objection to three; and the three classes of routes named should be recognized and provided for. And where indicators are used there is no need of an arm at all. The arm and the indicator or indicators used together to show the same movement are unnecessary and lead to uncertainty.

The only report from a standing committee was that on signaling, presented by W. G. Wattson, Chairman. The report opened with a discussion of the three kinds of block signaling, the telegraph, the controlled manual and the automatic. No railroad with a considerable traffic, slow and fast mixed, can afford to postpone the adoption of some one of these three systems. After discussing some of the relative merits of the different plans the report goes on:

The essential requisite of any block signal system is safety. The possibility of this requisite is contained in all of the three systems, dependent only upon the proper administration or supervision of the service. It is true that this conclusion is disputed by special advocates. Greater safety is claimed for the automatic, because it eliminates the human agent; on the other hand greater safety is claimed for the manually operated, because of the presence of the human agent to serve as a check upon the proper observance of signal indications by enginemen. These claims are largely matters of mere speculation. When safety is assured by several different systems the

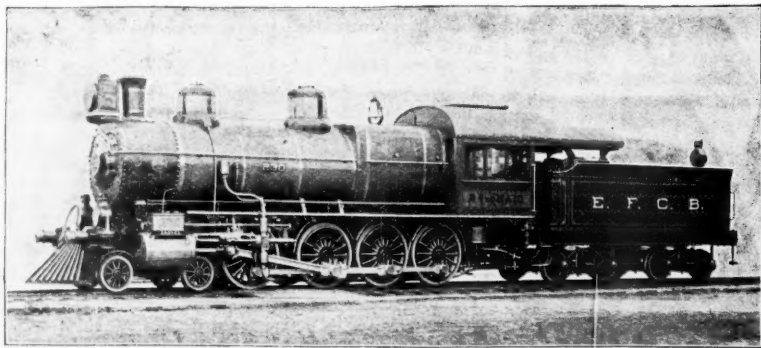
important question for individual roads is, which one is adaptable to meet the requirements of the particular service at the least cost. There is such a thing as paying too much for safety.

On crowded tracks where high speed through express trains, rapid transit suburban trains, accommodation passenger trains, and the various classes of freight trains are moved together, no attempt should be made to get along with anything less than the automatic or controlled manual system. On tracks over which only a moderate traffic is moved—say not to exceed 60 trains each way per day on double track, and not to exceed 30 trains each way per day on single track the telegraph system will afford protection, without hampering the movement of the traffic. On roads running through thickly settled sections of the country having stations close together, the cost of introducing the telegraph system would be insignificant. Fifty dollars per station will cover the cost of signals, and the station agents and night operators can generally be utilized as signalmen. On roads running through sparsely settled sections of the country where the stations are long distances apart and where sufficient station agents are not available for signalmen, the electric automatic system will generally be found to best meet the requirements of furnishing protection at a reasonable cost.

The aim of your committee is to bring home to the minds of railroad superintendents the fact that the day for discussing and pondering upon the question as to whether it is best to operate on the open road system or under block signals has gone by. The highest intelligence supported by experience in all countries has decided in favor of the block signal practice. The question now is what block system to adopt.

The afternoon session was given up to the topics presented for discussion in the call issued by the Secretary, and the discussion on the first one—Should the white light be discarded as a safety signal?—was opened by Mr. W. F. Potter, of the Flint & Pere Marquette, who believed the question should be answered in the affirmative. White lights will be confused with lights with which the engineer has nothing to do, and red glasses are liable to be broken, giving a safety signal where it should be danger. "At the same time," says Mr. Potter, "many roads have recently changed their common switch lights from green to white," so that a proposition to change back again should be supported by strong reasons. Several speakers argued that the present practice should be retained, because no great damage had ever resulted from the use of white for all-clear; but Mr. Potter at once cited four derailments which had come to his knowledge, two on account of the breaking of red glasses and two where a switchman holding a white light in his hand stood in front of the red light of a misplaced switch. Another member reported a very narrow escape where a passenger train ran past a block signal in which the red glass had been broken. After considerable desultory discussion, the main points of the problem hardly being touched upon, except in a very brief way by Mr. C. A. Hammond, it was voted as the sense of the meeting that there is not sufficient reason for discontinuing the use of white for all-clear.

The next question—What principles are to be recommended to promote uniformity and simplicity in fixed signals?—was referred to the Standing Committee on Signaling, to be reported upon at the next meeting. The question whether derailing switches should be used in the main track in large yards, where a derailment would destroy costly track and signal connections, and, where, by the frequency of train movements on adjoining tracks, a derailment would endanger many trains, was discussed



Twelve-wheel, Brooks Locomotive, Brazil Central Railroad.

briefly and finally referred to the Committee on Roadway, to be reported upon at the next meeting.

The main discussion of the afternoon was on the best way to get trained, reliable and loyal employees. The first speaker said that the way to have well trained men was to train them yourself; that is, in hiring new men to invariably take men who have not had railroad experience elsewhere; and from the hearty way in which numerous other members coincided with this view it is plain that this sound principle is much better appreciated by men who have to hire brakemen and men for other positions in the transportation department, than was the case a few years ago. One prominent member said that he never hired brakemen or telegraph operators who had been on other roads, and other members evidently follow this rule more or less closely.

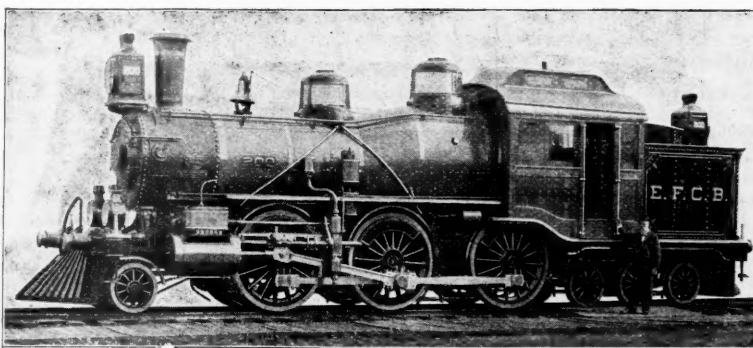
Referring to the question of "loyalty," it was well said that the Superintendent should be careful to be as loyal to his men as he expected the men to be toward the employer. The manifestation of sympathy with employees when they are in affliction was mentioned as a way in which a superintendent may often cement the friendship of his men. It is not well to be stingy with passes at such a time. While this point was well re-

ceived, no one explained how it could be applied by a superintendent who has a lot of "tramp brakemen," with whom domestic ties are almost an unknown quantity.

The rule that seniority shall govern in promotions, unless there are good reasons for departing from it, does more harm to discipline than any other one thing, said a prominent superintendent of the Erie. It throws upon the superintendent the burden of proof, in case he wishes to "jump" an old man; and rather than present the proofs he will promote the senior man. And the employees, knowing how this works, will depend upon their seniority and will not do their best.

Numerous speakers brought out other good points. To secure the confidence of your men always commend good conduct whenever possible. In many cases, putting a stop to whiskey drinking has cured most of the evils in the train service. Make men provident and you generally will keep them away from saloons; to make them provident they should not be allowed to assign their wages, or in any way to get their pay before it is due. At the same time the superintendent should be careful to see that no man suffers any real distress from lack of advance payment of his wages in emergencies. If you can once get the men to feel free to go to the superintendent with all their troubles you can make sure of their loyalty. The superintendent of an eastern road, well-known for its good discipline, summed up the reasons for his success in two points, careful selection of new men and strict discipline. The practice of making promotions on grounds of favoritism he has killed out. He personally examines all new candidates for positions in the train service.

As the hour for adjournment approached it was plain



Brooks, Suburban Locomotive, Brazil Central Railroad.

that the discussion could not be finished, and the question was referred to a special committee of seven to be appointed by the president. The Chairman of this Committee is Mr. C. R. Fitch, of the Erie.

The fifth topic—Experience with the standard code in cases of doubt—was referred to the Committee on Transportation for a report.

On the sixth topic—Economy in the handling of freight service—Mr. Wattson, of the West Shore, told how he had put in practice the plan heretofore discussed in the Car Accountants' Association, the New York Railroad Club and elsewhere, of loading his freight engines according to the actual weight of the cars and their contents, and not on the assumption that all loaded cars weigh the same. As yet he has only tried it on fast freight trains west bound, but has found it very satisfactory. The way-bill clerk or the loader puts the weight of the lading on the running slip which goes with the car (where the loaded car cannot be weighed) and the yardmaster makes up his trains by the figures shown on the slips. While many trains have thus successfully taken more cars than formerly, it happens now and then that a large shipment of full carloads (which are in the minority in the west bound movement) necessitates making the trains smaller than before. This is really advantageous, however, as it makes it more certain that the train will keep to its scheduled time. It appears that a number of roads now adjust their train loads by the capacities of the cars, more or less closely. One member said that where cars were loaded with miscellaneous merchandise he added about five cars to the regular number for a train on the assumption that a car would never be filled with such freight to its full capacity.

The meeting closed with the election of C. B. Price (Allegheny Valley), as First Vice-President; C. R. Fitch, (Erie), Second Vice-President, and C. A. Brunn, (Erie), and W. F. Potter (F. & P. M.) members of Executive Committee.

In the evening the third annual dinner of the Society was held at the Brunswick. Like its predecessors it proved very enjoyable.

Brooks Locomotives for Brazil.

We have heretofore described briefly the locomotives building by the Brooks Works for the Brazil Central Railroad (Estrada de Ferro Central do Brazil). We are able now to show illustrations, from photographs, of the two types of broad gage locomotive and to give some further particulars. The twelve-wheel engine, "mastodon" type, stands 14 ft. 6 in. above the rail level, that limit being fixed by the structures on the line, which accounts for the short smoke stack. The leading dimensions of the engine are given in the table below:

DIMENSIONS, 12-WHEEL LOCOMOTIVE.

Gage.....	5 ft. 3 in.
Weight on drivers.....	140,000 lbs.
" truck wheels.....	30,000 lbs.
" total.....	170,000 lbs.
" engine and tender.....	252,000 lbs.
Drivers, number.....	Eight
" diameter.....	54 in.
Driving axle, diameter.....	9 in.
Cylinders, diameter.....	21 in.
Piston, stroke.....	26 in.
Steam ports, length.....	18 1/2 in.
" width.....	1 1/2 in.
Exhaust ports, width.....	3 1/2 in.
Valves.....	Richardson balanced
" lap.....	5/8 in.
" lead in full gear.....	1 1/2 in.
Boiler.....	Improved Bellpaire (Player's patent)
" material in barrel.....	Steel
" thickness of material in barrel.....	1 1/2 in.
" diameter of barrel.....	68 in.
Length.....	28 ft. 7 1/2 in.
Tubes, number.....	248
" material.....	Iron
" diameter.....	2 1/2 in.
" length.....	13 ft. 10 1/2 in.
Firebox, length.....	114 in.
" width.....	38 1/2 in.
" material.....	Copper
" thickness of sheets.....	1 1/2 in.
" flue sheets.....	1 1/2 in.
Grate.....	Water tub

An important peculiarity of these engines is the improved Bellpaire firebox patented by Mr. John Player, Mechanical Engineer of the Brooks Works. The top of this is arched, as is the crown sheet, and the crown stays are radial. A brick arch is used supported on tubes from the crown sheet to the flue sheet. The engine is a good deal decorated with brass to please the purchaser's fancy the cylinders, steam-chests, sand-box and dome having brass casings and various other parts being

similarly ornamented. The engine is provided with buffers in front and on the rear of the tender which fold back when not in use. It has two No. 10 monitor injectors as well as a pump, and is fitted with the Westinghouse air brake apparatus and American equalized driver brakes. It is provided also with the Le Châtelier water brake.

The suburban engine has the dimensions noted below:

DIMENSIONS, SUBURBAN LOCOMOTIVE.

Gage.....	5 ft. 3 in.
Weight on drivers.....	110,000 lbs.
" truck, 2 wheels.....	16,000 lbs.
" " 6 ".....	50,000 lbs.
Total.....	176,000 lbs.
Drivers, number.....	6
" diameter.....	62 in.
Cylinders, diameter.....	18 in.
Piston, stroke.....	24 in.
Boiler, diameter of barrel.....	58 in.
Firebox, length.....	96 in.
" width.....	38 1/2 in.

Mail, Express and Freight Service on Street Railroads.*

BY RICHARD M'CULOCK, *Electrical Engineer of the Citizens' Railway Co., of St. Louis, Mo.*

In order to ascertain as well as possible how much has already been done, a circular asking for information in regard to mail, express and freight service was sent to every street railroad company in North America. Nine hundred and seventy-eight letters were sent out, and 413 replies received. These replies are tabulated below. As a great many roads were not heard from, it cannot be assumed that the table is absolutely correct, but it is probable that most of the companies having such a service answered. The roads enumerated are only those having express or freight service fully developed. The carrying of packages by conductors of passenger cars was not called express service, but is enumerated in a separate column. From some of the States, notably Pennsylvania, Rhode Island and Massachusetts, it was reported that the transportation of express and freight by street railroads was prohibited by State law, and many of the roads answered that their franchises allowed only the transportation of passengers. The rate charged on express matter is usually 5 or 10 cents per package, while the freight rates vary from 4 to 10 cents per 100 lbs. The mail is usually carried either under a direct contract with the Government, or under a sub-contract with a mail contractor. The income from the transportation of the mails varies from \$100 to

*Extracts from a paper read at the Atlanta Convention of the American Street Railway Association.

\$1,000 per annum, according to the amount of mail, the number of trips per day, and the length of the haul.

TABLE OF SERVICE—NUMBER OF ROADS.

	Any Form of Such Service.	Under Contract with Express Co. or U. S. Government.	Under Contract with R. R. Freight Car Cover Street R. R. Tracks.	Operate Special Cars for this Service.	Carry Small Bundles on Passenger Cars for Pay.	Contemplate Such Service.	Distribute Matter Beyond Station.	Use Combination Express and Passenger Car.
Mail.....	62	58	.....	5	.....	10	.....	.....
Express.....	35	8	.....	9	31	7	2	8
Freight.....	55	.....	6	37	.....	12	2	.....

MAIL SERVICE.

Sixty-two roads are now carrying Uncle Sam's mail, while 58 have Government contracts. Most of these are suburban roads, or roads joining towns; but the postal authorities are now beginning to make arrangements with the large city systems for transportation of the mails from main post offices to branches and for distribution and collection throughout the city.

Various methods of utilizing street railroads for this purpose have been proposed by different local post office authorities. In one large Western city, in which all the roads are controlled by one company, it was proposed to equip one car of each line with a mail receptacle. At stated times, the carriers along the route were to meet this car and drop into the receptacle all the mail collected by them, which was in turn to be taken from the receptacle as the car passed the main post office. This plan, however, did not meet with approval at Washington, and was abandoned. A system of this kind would greatly expedite the collection of mails, but the weak point seems to be that no provision is made for their distribution.

The only method of handling a large mail service, in which it is necessary to collect and distribute along the route, and handle it satisfactorily both to the patrons of the road and the Post Office Department seems to be in the use of an independent mail car in charge of a mail clerk. This system is already in use in St. Louis, Brooklyn and several other places, and is giving satisfaction to the companies and the post office authorities. The mail is quickly and promptly handled; the service is regular and certain; great and small quantities of mail may be collected and distributed with equal facility; the residents along the line are greatly accommodated, and no interruption or inconvenience to the passenger traffic results.

As an example of such a service, it would probably be interesting to describe the operation of a United States mail street car which has been run in St. Louis for the last three years. The St. Louis & Suburban Railway begins in the business part of the city, and runs through the choicest residence and suburban settlements of the town of Florissant, 16 miles from the center of the city. After leaving the city limits, the line penetrates the beautiful Florissant valley, thickly dotted with pleasure resorts, country clubs, summer homes and suburban villas. The downtown portion of the road was formerly a cable, and the suburban part a narrow-gauge steam line, but the road is now electric throughout. The mail car makes three trips a day, two through Florissant and one as far as the city limits. The railroad company furnishes a conductor and motorman, while the Post Office Department supplies the mail clerks. The car was built and equipped especially for this purpose. At a scheduled time it is run up in front of the post office and receives the mail put up in pouches from a wagon there to meet it. The mail clerk receives a bag for each station outside the city limits, and for each carrier along the route a bag designated by his number. He also receives all mail which has come in too late for assortment, which is distributed on the car to the proper bags before reaching the first station. Letters are received, canceled and distributed on this car, just as in the ordinary steam railroad mail car. The first stop is at a point about one and a half miles from the post office. At this point six carriers meet the car and each carrier receives from the mail clerk the pouch, bearing his number. Another stop is made about two miles out, another two and a half, another three, and another four miles from the post office. Any mail for the suburbs is handed to the mail clerk by the carriers and dropped into the proper bag by him. After the city limits are passed, bags are exchanged at each station, just as on a steam railroad. On the return trip the same system is followed until the city limits are reached. Within the city, the Post Office Department has placed letter boxes at the principal corners along the line. Each carrier brings the mail collected in his district to the nearest box on the line of the railroad. Stops being made at each box, the mail clerk removes the mail, and assort it before arriving at the next station. The letters thus canceled and assorted are delivered at the main post office, tied up in bundles ready for shipment.

A light freight business is also done on the car. Provisions, light furniture, milk, trunks, etc., are carried and the charges collected by the conductor.

The system just described seems the best that has yet been devised for the handling of a large mail business. There can be no objection to carrying the mail sacks on the front platform, if their number is not too great; but passenger cars should not be stopped and held for mail collections, nor should valuable space within a passenger car be taken up with mail sacks.

An advantage in estimating the advisability of inaugurating a mail service, is that a certain fixed income may be assumed, which is not the case with any other service. Large city systems covering various parts of the city and passing close to post offices and public buildings would afford great advantages in distributing and collecting the mails. Suburban roads, roads connecting towns, and those running to depots in the outskirts of the city are other instances of openings for mail service.

An advantage, independent of any financial return, and one which is regarded by many as the one reason for street roads embarking in the service, lies in the prestige of Uncle Sam's name. This point was never so thoroughly illustrated as in the late labor troubles in Chicago.

EXPRESS AND FREIGHT SERVICE.

The answers to the circulars showed that 35 roads are now engaged in the express business, while 55 are hauling freight. As a matter of fact, however, few roads through the country are doing a regular freight business, most of the so-called freight services partaking more of the nature of express. As operated upon street railroads, the distinction between express and light freight service

is so ill defined that it is deemed best to consider both subjects together.

Many conditions will suggest themselves to managers in which an express or freight service may be made a paying institution. In the case of a town in which the railroad station is some distance from the business part of the town, there can be no quicker, safer and better plan of conveying express and freight to some distributing point in the heart of the town, than by the street railroad. A case often met with through the country is that of two towns connected by an electric road, one of which, having no steam railroad, is obliged to get all its supplies through the other town. The installation of a freight service of some kind would at once suggest itself in this case.

The operation of an express service on large city systems has not been attempted to any great extent, but it has been contended by some enthusiasts on the subject that a street car express service will eventually take the place of the many city deliveries and city express wagons now in use. As an example, of a city road operating an express and freight service involving collection and a house to house delivery, it would be interesting to cite the case of the Southern Railway of St. Louis, which has been operating an express service on this plan for almost two years. The line begins in the heart of the city, and runs in a southerly direction for seven miles, following the general direction of the river to Carondelet. The territory penetrated is thickly settled for almost the entire distance, and in no essential does the road differ from the ordinary city street railroad. Three trips per day are made upon schedule time by the express car, which is entirely independent, being mounted upon motors of its own. At the down-town end is a receiving station where a clerk receives all express consigned to the company, and keeps all the books pertaining to the service.

The special feature of this service, however, is the collection and delivery. This is effected by means of wagons, two of which are kept at the down-town end of the road, and three of which meet the car on all trips at certain points along the line. On receiving notice by mail, telephone, or otherwise, a wagon calls for a package, delivers it at the car, from which it is handed to the proper wagon and delivered to the address marked on the package. A charge of 10 cents per package is made for this delivery, and trunks are taken from houses to the Union Depot, checked, and the checks returned, for the sum of 50 cents. A corresponding charge according to size is made for the delivery of large boxes and bundles. Large dry goods and clothing houses have ceased to run their delivery wagons into this part of the city, and now consign all of their bundles to the railroad company. Where formerly one delivery daily was made by the wagons, three are now made by the railroad. Several large factories located in the southern part of the city also consign all their freight to the electric express. The goods are put on the car, taken to the proper railroad stations, shipped, and the bill of lading returned to the consignor. Packages are received by the express car C. O. D., charges collected, credited to the proper account, and settlements made at the end of each month. The railroad company assumes all the responsibilities of a common carrier, holding itself liable for all loss and damages. This, however, is a contingency which seldom occurs. The service is well patronized, both by the residents along the line and the large retail stores in the center of the city. It does not interfere with the regular running of the cars, and since its inauguration has never failed to pay.

Up to this point we have considered an express and freight service merely as a paying or non-paying institution, to be adopted in the one case and to be rejected in the other. There is another view which may be taken of the case, however, which is in many instances the most proper solution of the problem. This is to regard the establishment of this service merely as an auxiliary to the passenger traffic, to be operated whether it pays or not, in order to gain increased passenger travel. The most notable instances of this sort are the roads which run from the hearts of our large cities out into the suburbs. It is manifestly to the interest of these roads to promote building and settlement along their lines, and how can they better attract builders than by giving their patrons all the advantages of city life, not only in furnishing them with rapid transportation to and from the city, but in aiding them in receiving their provisions and supplies? This calls for some form of express service, and although the receipts from this source may not equal the expenses, the increased passenger receipts and the advertisement given the road must also be taken into account.

In all street railroad practice, the cardinal point of any service, whether mail, freight or express, must be that it does not interfere in the least with the passenger travel, and this point should always be kept in view in the arrangement of such a service. For this reason we would strongly advocate the use of separate cars, operated by separate motive power and by separate men. In roads between towns, or suburban roads where stops are made only at certain stations, a combination car or a trailer might be used; but in city roads the system of piling trunks and boxes inside the passenger car and on the front platform, and stopping for these to be put on and taken off, is not of the era of the electric road. Another system yet, in vogue in some places, is that of receiving small packages for transportation and allowing the conductor to deliver them along the route. If the addition of a package service renders necessary such a reduction in the efficiency of the passenger service, it is difficult to perceive the gain in accommodation. A passenger car should carry passengers. It should stop and start for passengers alone, and it should reach the end of the road in the shortest possible time.

Before leaving the subject of express service, it might not be out of place to give a brief description of a novel form, soon to be introduced upon the Union Depot Railroad of St. Louis, in which the freight is to consist of members of the *genus homo*, in a more or less disjointed state. This great railroad system extends to almost all part of the city, passing nearly all of the city institutions, including the Dispensary, City Hospital, and several of the other hospitals, and at the desire of the city authorities it is now having built a hospital car. As designed, it is a 25 ft. body, double truck car, having a double floor filled with asbestos to deaden sound. It is proposed to utilize it primarily in conveying patients from the Dispensary to hospitals. It can also be used in case of a great fire or calamity in which there are many injured, and where the horse ambulances are not capable of handling the work. The car is to be equipped with stretchers, folding chairs, a tank of water, apparatus for heating water by electricity, an emergency drug store, dressings, instruments, earth closets, and all necessary apparatus for taking care of the sick and injured. A surgeon is to be in charge of the car and will accompany it on all its trips. It is intended by the city authorities to make arrangements to run the car over all the electric tracks in the city, as this will enable them to reach almost any point within the city limits.

Air Brakes vs. Hand Brakes for Street Cars.*

BY E. J. WESSELS.

Recognizing the inadequacy of a single hand brake on grades, many roads have provided a duplicate inside equipment. This extra equipment is additionally expensive, not only in first cost, but especially in maintenance.

A motorman realizes how difficult it is to keep his car under control, hence he sets one brake before the car starts down grade. He then depends upon his other brake. Manifestly, when one brake is set from start to finish, it means wear and tear of apparatus and short life for the shoes. Moreover, the speed of car is needlessly retarded and fewer car miles per day can be run than would be made if he had a positive braking outfit at command.

Friction (or continuous) brakes operated from the axle have been in use for years on cable system and the jar from them has caused constant complaint. On electric cars friction brakes cannot be used. The full power of a friction brake depends upon the load carried in the axle to which friction discs are attached. For example, with a grip car and passengers weighing 8,000 lbs., the weight being equally divided between the two axles, leaves 4,000 lbs. carried by the axle with friction discs. With car wheels of two and one-half times the diameter of friction drum, we gain that much leverage, which multiplied by 4,000 gives the direct pull power of friction brake of 10,000 lbs. The brake levers of street cars are as a rule adjusted to about four and one-half times leverage. If, then, we multiply the 10,000 lbs. pull of friction brake by this leverage we have a strain of 45,000 lbs. upon brake beam and shoes. When two or more cars are coupled together it is impossible to regulate brake chains and brake gear so that every shoe will press with equal force against the wheel. When, therefore, a gripman applies his friction brake, the entire 45,000 lbs. is carried by the beam and shoe that are adjusted nearest the wheels and the remaining wheels revolve without noticeable check.

In a train of three four-wheel cars with passengers, weighing 36,000 lbs., resting on twelve wheels, a brake power of say 2,900 lbs. applied to each wheel would make the most perfect stop. If the entire 45,000 lbs. power of friction brake is applied to only two wheels of such train, there will be 38,000 lbs. more power exerted than necessary to stop the wheels from revolving, and at same time only one-sixth effectual braking power is obtained as compared with a braking pressure distributed against every wheel under the train. Such harsh, rigid, excessive power of the friction brake, applied quickly by the momentum of the whole train, will wear out any kind of brake gear, no matter how good or how strongly made, and the constant jar adversely affects the life of cars. In cold, wet and stormy weather (with slippery tracks), the pull power of friction drum is greatly reduced just at the time it is most needed to set the brakes on trailers, which are always overcrowded at such a time.

A 28-ft. closed electric car weighing without passengers 20,000 lbs. and running at 10 miles per hour, has over six times the energy to overcome when brakes are applied, than a horse car has, weighing one-fourth as much and traveling at less than one-half the speed. Moreover, when horses were employed there were 10 ft. of extra length in which to stop the car. Unless cars have proper brakes high speeds are most dangerous.

Probably 75 per cent. of recorded accidents is chargeable to inefficient brakes. Some records show even a higher percentage. While hand-brakes often stop cars quickly, they do so by consuming excessive energy. Then, too, it is impossible for a motorman to maintain his maximum strength for a long time. In active service he has to apply brakes between 250 and 400 times daily. Motormen or gripmen as a rule are intelligent, and during the recent financial depression many recruits have been made who formerly filled much higher spheres. The strain of a day's work on these men is very severe. When we consider how many chances people take in crossing tracks in front of moving cars, or in jumping on or off despite printed warnings, this strain becomes more apparent. A motorman is not allowed to shout. In the presence of danger he can only rely upon his gong or whistle and his arms. The most painful thing which comes under a street railroad man's notice, is the killing or maiming, especially of children.

It is a menace to life and property to have a high-speed motor at work, without having suitable power to control it. Thus far "reversing" has not proved a success, and, while theoretically one motor acts as a generator to drive the other (if there be two, which is not always the case), in practice this has proved a failure. The danger of relying upon the same current which propels a car to stop it, is only too apparent. If the current fails to work in one case, how can it be expected to work in another? The trolley may run off, or there may be a break in the line when current is needed for braking a car plunging down grade.

When hand brakes are used it is necessary to have a separate brakeman for each trailer. When an air-brake is used, these extra men are entirely dispensed with. Moreover, when air-brakes are used, there is no shuttle movement, jerking or bumping, and the shoes are applied evenly to all the wheels; whereas in hand-braking it is impossible for different men on different cars to brake in harmony. One car will be braked hard and another not so hard.

Mr. Wessels then gives some features of the air-brake with which our readers are familiar.

Recently a new form of power-brake has been announced, in which electricity is relied upon. The electric brake, while undoubtedly possessing some valuable features, has some which are a decided disadvantage. It is, of course, in its infancy, and its future will be watched with interest. In the paper read by Mr. Elmer A. Sperry on September 19, before the American Institute of Electrical Engineers, entitled, "The Electric Brake in Practice," he states that with an electric brake the brake shoes are entirely dispensed with. Suppose, as may happen, the electric brake fails to work, what will become of the car or train. There is an apparent contradiction in the article on this point. In one place it states that the electric brake does away with brake shoes, and in another place it admits that it will be necessary to resort to hand-brakes. How can hand-brakes be used without shoes, and how can a car be held by an electric brake after the residual magnetism (or Foucault current) is dissipated? Mr. Sperry says that the one grave fault of an air-brake in railroad service is that the maximum brake application does not exist as it should at the higher speeds. This is an error. The immense advantage of an air-brake over an electric brake is the fact that power can be applied in varying degrees.

An air-brake holds the wheels and keeps doing so. An electric brake, after the first stop, depends wholly upon residual magnetism. This, at its best, is an uncer-

*Extracts from a paper read at the Atlanta meeting of the American Street Railway Association.

tain factor. As we understand the paper, the residual magnetism in the electric brake is only available for something less than one-half minute after the car has stopped. When this magnetism is consumed the electric brake possesses no more braking power whatever until the car is again in motion. It is right here that the air-brake shows its immense superiority, for it has the air reservoirs to draw upon when the car has stopped, and therefore ample power is available for immediate and constant use. This failure in source of supply is a tremendously weak point in an electric brake. The paper states that "the current flowing after motion ceases, though small, is found exceedingly useful in holding the car from starting itself, even on quite a heavy grade, as only a small quantity of energy, added to the already great friction of quiescence, will prevent the car from starting." We fear that at such times the advocate of electric brakes would need something more reliable and constant to lean upon. The paper says, "when an electric brake is used it seems as though the car was running into an air cushion." This pays a well-merited compliment to air-brakes for by them an air cushion stop is made possible. The paper adds "operating the brake in this manner it will at once be seen that the system is one of the utmost certainty of operation, surer even than the hand-brake, air, or other power brakes." If the speaker had not been for some years in the electric motor business, he might not take such decided exception to this claim as he does; but since working with air pressures he has found them much more reliable and safer than electricity. The inventor referred to makes 14 claims of the advantages of his brake over other brake systems. As this paper is not written for advertising effects, we purposely refrain from naming any special make of air-brake in contrasting the air-brake with the electric.

1st. He speaks of the certainty of an electric brake in operating.

2d. "The enormous power and under perfect control."

A good air-brake has much more power, more constant power, and is under better control. It will be noticed that the inventor omits all reference to electric brake power being constant. This lack of constant braking power is the objectionable and fatal defect of the electric brake. It will not be noticeable on a level, but it will be only too apparent on a grade. At the Institute meeting, before which the paper on electric brakes was read, one of the members stated he had been on a train in Connecticut where two motor cars and three trailers were ascending a 9 per cent. grade. While doing so a fuse on the second motor car blew out, throwing all the work on the first motor car. This it was unable to do, and hand-brakes had to be immediately applied to prevent train from running away. The author of the paper was asked "what would you do at such a time with your electric brake?" Mr. Sperry, in reply to the question, said that a case of this kind was rather unusual, but that he would have applied the electric brakes, which would have brought the train to a stand-still, and by that time the hand-brakes could be applied to prevent the car from running backward down the grade. How then can he claim that the brake dispenses with brake shoes, and if the electric brake had been used on the train in question to the exclusion of hand-brakes and brake shoes, what would have become of the train and passengers?

3d. "The absence of all power absorption at moneyed cost from the central station."

This may be true if brake shoes are not used, but remains to be proved in daily service. Shoes probably will continue to be used. A good air-brake consumes very little power.

4th. "Its high efficiency, being far superior to compressed air; amply proven in numberless instances where electricity has replaced air. (The air requires a direct application of energy, amounting to an immense aggregate power-absorption during the day from the central station; the working parts of the air machinery are attached to the car axles and require a large quantity of energy not only while compressing, but at other times as well.)"

We are unaware of a single case where electricity has replaced air. We are informed on high authority that air-compressors for driving rock drills and coal cutters so greatly outnumber electrical machinery for such purposes that hundreds of air compressors are sold for every drill or cutter sold. The statement that an air-brake requires a large quantity of energy not only while compressing, but at other times as well, is wholly inaccurate and entirely incapable of proof. A good air pump requires no perceptible power after it cuts out.

We had no intention to refer at length to electric brakes, but have felt constrained to do so because the statements we have replied to appear in the printed Transactions of the American Institute of Electrical Engineers, and should not remain uncontradicted.

Lastly it must be remembered that the magnetic clutch of this electric brake has to bear on the surface of a flat disc cast upon the car wheel. This can hardly be called "ease of application," for the brake cannot be applied to the ordinary type of street car wheel. It requires a special casting to be made on one wheel on each axle. This on a large system means an additional outlay for wheels, as "extras are charged for."

Dedel's Switch-Lock.

Mr. Louis Dedel, of New Orleans, objects to our description of his switch-lock as given in the *Railroad Gazette* of August 17, and avers that his device is his own original invention; and he sends us a copy of his patent. Of course, we do not deny Mr. Dedel's statement; and, in fact, we said nothing to conflict with it in the note we published. As all persons familiar with the Patent Office understand, the re-invention of old devices is an everyday occurrence.

But we will give Mr. Dedel's drawings and let the writer make his own comparisons between this and the well-known English device for the same purpose. Dedel's lock, attached to a switch, is shown at A, Fig. 1. As will be seen by the other drawings in the figure, a projection on the switch-lever, when brought in contact with a similar piece fixed to the switch-stand, makes a double hooked projection upon which the lock is pushed. The essential feature of the invention is the lock, Fig. 2. The two jaws, pivoted at the center, work precisely like a pair of shears, the four flat springs, one at each end, top and bottom, tending to keep the shears constantly closed. In the cut, the lock is attached to the switch, and the key is ready to be inserted at the opposite end of the lock. It is impossible to remove the lock from the switch with-

out the key, because the projections on the pieces C D will catch on the hooks of the jaws, which the springs are constantly pressing toward each other. But after the insertion of the key, holding the jaws apart, the lock can be withdrawn and the switch set for the side track. It is now impossible to remove the key, for the same reason that before it was impossible to withdraw the lock from

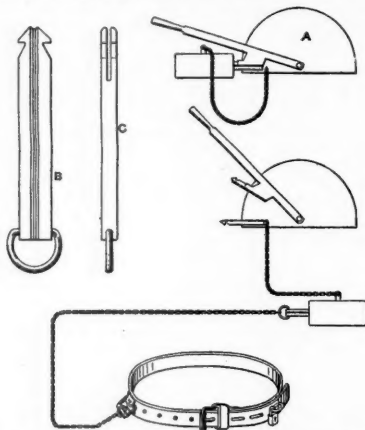


Fig. 1—Dedel's Switch-lock, Key and Belt.

the switch. When the lock is restored to the switch, the jaws are again held open so that the key can be withdrawn. The key is attached to a belt worn by the attendant, and he cannot remove the belt until it has been unlocked by the authorized person, say the signalman at the nearest station, who has previously fastened it upon him with a padlock.

Thus, the person who turns the switch must stand by

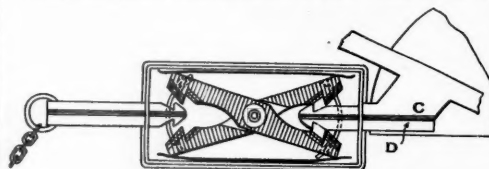


Fig. 2—Dedel's Switch-Lock.

it while it is set for the side track; and the inventor's design is accomplished. The key is shown at B and C, Fig. 1. The vertical curved pieces in the lock, to engage the slot in the end of the key, are shown in light lines in Fig. 2. These pieces prevent opening the lock by unauthorized keys.

Interlocking and Signaling in the United States.

Readers of the *Railroad Gazette* who are interested in signaling will perhaps recollect that on Sept. 19, 1884, and Nov. 20, 1885, we printed tables showing in considerable detail the extent to which interlocking machines for switches and signals, and automatic block signals, had been put in use by the various railroads of the country. These tables showed, that up to September, 1884, the Union Switch & Signal Co. had put in about 136 signal plants, aggregating 2,112 levers; and that during 15 months following that date the same company put in 547 levers, equal to more than one-quarter the total shown in the first table. This company has now favored us with a brief statement of the amount of work done since Nov. 20, 1885, from which we are able to compile the following table:

INTERLOCKING.	
Saxby & Farmer improved.....	Levers. 14,414
Stevens.....	621
Horizontal.....	108
Ground.....	158
Total mechanical levers.....	15,301
Electo-pneumatic.....	1,600
Total interlocking levers.....	16,901
BLOCK-SIGNALS.	
Pneumatic automatic.....	1,500
Electric automatic.....	885
	2,385

It will be noticed that the electro-pneumatic machines are not included with the mechanical in the first tabular summary. In the records to Nov. 20, 1885, these were included with the rest, and we find that there were 144 levers operated by the pneumatic apparatus and 106 by hydraulic (at St. Louis). This leaves 2,409 mechanical levers previous to November, 1885; the number since then (15,301) is therefore more than 6 times as many as the total number erected previously. The first interlocking machine in the United States was erected in 1874, so that the totals recorded in 1884, and at the present time, divide the time, it will be seen, into nearly equal periods of about 10 years each.

We have also received a statement from the Johnson Railroad Signal Co., which was organized in 1888, and began the manufacture of signal apparatus in August of that year. In this period of about six years the company has erected 595 machines and the aggregate number of levers is 6,000. The number of spare spaces in these machines aggregates 973. The company has favored us with a list showing the location of each machine included in this report, from which we have made up the

table which appears below. The average number of levers to each machine is reduced by the fact that a considerable proportion of the apparatus furnished to the New York, Lake Erie & Western was for block signal towers where there were only two levers in each machine. In the first part of the table, showing 14 roads, we have included every road to which was supplied more than 99 levers, and the names are arranged alphabetically; in the second part the roads have been named in geographical order, as near as possible.

INTERLOCKING APPARATUS MADE BY THE JOHNSON RAILROAD SIGNAL CO.

Boston & Maine, levers.....	100
Central of New Jersey.....	132
Chesapeake & Ohio.....	194
Chicago & Northern Pacific.....	200
Delaware, Lackawanna & Western.....	194
Grand Central Station, New York.....	108
Illinois Central.....	113
Long Island.....	320
Manhattan.....	330
New York Central & Hudson River.....	914
New York, Lake Erie & Western.....	857
New York, New Haven & Hartford.....	1,024
Old Colony.....	232
Pennsylvania.....	159—4,877
Boston & Albany.....	16
Fitchburg.....	52
New York & New England.....	12
Brooklyn Elevated.....	20
Prospect Park & Coney Island.....	92
Suburban Rapid Transit.....	36
Delaware & Hudson.....	12
New York, Ontario & Western.....	60
Poughkeepsie Bridge.....	2
Camden & Atlantic.....	8
West Jersey.....	14
Philadelphia, Wilmington & Baltimore.....	16
Lehigh Valley.....	30
Philadelphia & Reading.....	54
Beech Creek.....	4
Northern Central.....	12
Chicago & West Michigan.....	10
Flint & Pere Marquette.....	11
Cincinnati, New Orleans & Texas Pacific.....	34
Nashville, Chattanooga & St. Louis.....	10
Savannah, Florida & Western.....	20
Atlantic & Danville.....	6
Cleveland, Cincinnati, Chicago & St. Louis.....	20
Chicago, Burlington & Quincy.....	36
Chicago & Western Indiana.....	90
Chicago & Eastern Illinois.....	72
Chicago, Madison & Northern.....	40
Lake Shore & Michigan Southern.....	12
Lake Street Elevated (Chicago).....	28
Terminal Railroad Association of St. Louis.....	68
Missouri Pacific.....	56
St. Louis, Keokuk & Northwestern.....	44
Miscellaneous, including 4 for Cuba.....	126—1,123
Total number of levers.....	6,000

The Pecos Valley Railroad.

The extension of the Pecos Valley Railroad from Eddy north to Roswell, New Mexico, begun last April, was completed Oct. 6, and the road was formally opened on the 5th by a public celebration in Roswell, which was attended by those identified with the great work being accomplished in the Pecos Valley, by the Governor and leading men and politicians of the territory, and by people attracted by means of special excursion rates for the occasion.

The railroad, though but a part of the great project which has for its ultimate object the reclamation of an immense region of arid land is none the less an important piece of work for the times. The company was organized during the summer of 1890 and building was begun in the autumn of that year from Pecos City, Tex., a station on the Texas & Pacific. The line was completed to Eddy, N. M., in the spring of 1891, and now the entire surveyed route has been put in operation, giving a line of 164 miles through what is destined to become a most fruitful and productive valley. The road is bonded at \$12,000 a mile in Texas and \$15,000 in New Mexico.

The right of way is along a gently sloping prairie country with maximum grades of less than one per cent. There are no sharp curves and in the entire distance only five truss bridges will be needed. At present only temporary bridges are in place. The line is of standard gage. The present equipment consists of two Cooke, two Baldwin and two Schenectady locomotives of 80,000 lbs. weight each; two combination sleeping and reclining chair cars, built by the Barney & Smith Car Co., of Dayton, O.; four day coaches, four combination coach and baggage cars, 30 platform, 30 box cars, and soon there will be added a like number of stock cars. The company has an authorized capital of \$8,000,000. J. J. Hagerman, of Colorado Springs, is President; Percy Hagerman, Treasurer; Arthur S. Goetz, Secretary; and J. N. Miller, General Manager.

In order that the true significance of this railroad may be understood, it is necessary to review briefly the great irrigation scheme for that valley. When cattle raising was a very prosperous business, C. B. Eddy, a prominent stockman, located a range in the Pecos Valley. The Pecos River rises in the snow-clad Rocky Mountains of New Mexico, and follows the foot hills for about 200 miles, and then flows southward across the desert country between high grassy bluffs, until its course for 200 miles further is through a gently sloping plateau from which the hills recede, leaving a great sandy track, which, if well watered, would support a great number of people. The river receives along its course a number of small streams and many springs issue from the limestone bed underlying the entire valley. The flow of these springs is considerable, and is unfailing. Even where the entire flow of the river is diverted by the irrigating dams and canals, the river below is apparently as wide and as deep as though none of its flow had thus been taken off.

With such a country the cattle grower was delighted, and his herds of cattle found an unlimited range for graz-

ing and plenty of water. At Roswell were several springs of great volume, and there a small settlement was formed. A number of farmers located upon lands which were easily irrigated, built small irrigating ditches, and these farms, now ten and twelve years old, have fully demonstrated the great productiveness of the soil.

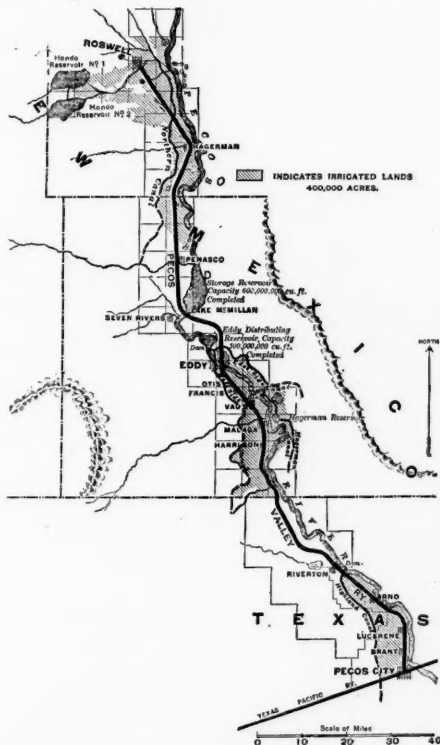
Later, a newspaper man, named Green, drifted into the district from Santa Fe and realizing the great advantages of the unlimited water supply he induced Mr. Eddy to begin the development of the valley upon a liberal scale. The undertaking was found to be beyond their means and they were compelled to look for some one with the capital to carry out the necessary works. Mr. Hagerman, who had been most successful in the development of mining, railroad and other properties, was induced to look into the matter and eventually he took hold of the scheme. Under his management it has broadened out into one of the great undertakings of the present time in this country.

The Pecos Irrigation & Improvement Co. was formed to carry the work forward. The necessity for means of easy transportation became apparent, and the Pecos Valley Railway Co. was organized. This was followed by the Pecos Town Co., and, finally, under the laws of New Jersey, the Pecos Company was formed, which has acquired the stock of the other three companies.

Four years ago the Pecos Irrigation & Improvement Co. with a capital of \$1,750,000, began the reclamation of the arid lands. The Northern Canal, 35 miles long, was constructed, taking the water of the Rio Hondo, a tributary, and traversing a tract which brought 67,000 acres under water. To increase the supply of water for this canal a reservoir site has been surveyed capable of retaining 1,300,000,000 cubic feet of water.

The Southern Canal system is still more extensive. It takes the water of the Pecos, impounds it in reservoirs and distributes it over the vast plain. Eighteen miles above Eddy a dam resting upon rock bottom has been built across the entire river, and a natural basin becomes a great retaining reservoir. The dam is 1,686 ft. long, 306 ft. wide at the base, 80 ft. at the crown, 52 ft. high at its greatest point, and submerges 8,100 acres, affording a capacity of six billion cubic feet. Another dam is constructed 12 miles further down the river. This is 1,150 ft. long, 50 ft. high and submerges 1,032 acres.

From this reservoir the Southern Canal leads the water through a rock cut out on the plains for a distance of 40 miles. This canal is 45 ft. wide, and carries seven feet of water when full. Three miles below the Eddy dam the canal crosses the river by means of a flume 468 ft. in length. A large lateral taps this canal, forming the East Side Canal, 19 miles in length. Ten miles below Eddy the surplus water and the supply from other springs is stopped and diverted by another dam into the Hagerman canal and Lake Surprise reservoir. Under this canal 15,000 acres of land can be watered. The Highland Canal, 69 miles below Eddy, now 13 miles long, has a surveyed length of 42 miles, and when completed will irrigate 35,-



The Pecos Valley Railroad.

000 acres. The total length of water conduits under construction and in operation in the Pecos Valley is as follows: Main canals, 121 miles; main laterals, 273 miles, sub-laterals, 900 miles.

All these lands the company offers to settlers with perpetual water right; the best tracts can now be purchased at \$35 an acre in ten annual payments at 6 per cent. interest.

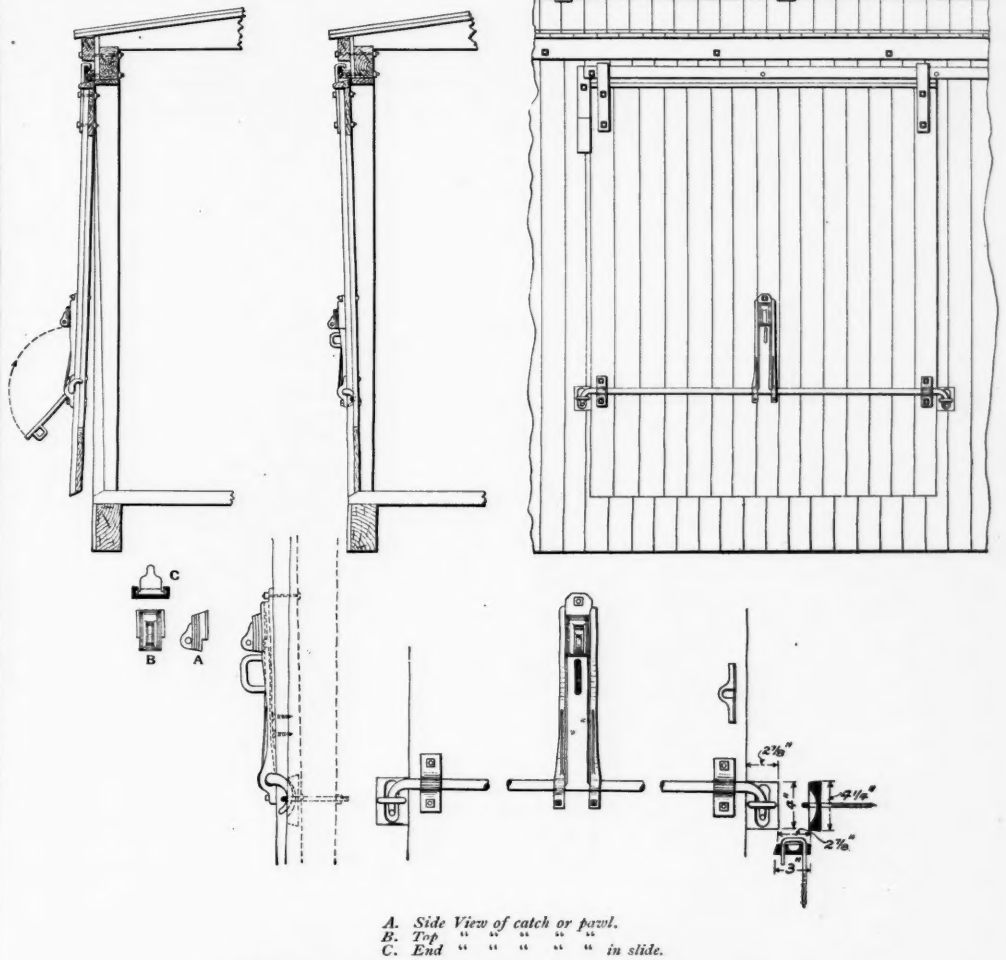
Roswell has a population of 1,000 and Eddy of 2,500; both towns are growing and the farming region already makes quite a business for the railroad. Last year the

railroad hauled out 29,000 tons of wool and the stock business is very good. Traffic centers at Eddy and Roswell from a territory of a radius of 75 miles. The company expect to eventually extend the railroad across the country to Albuquerque, thus giving a northern outlet to the valley.

Mooney's Patent Car Door.

The engraving herewith shows a storm-and-spark proof car-door, designed and patented by Mr. P. T. Mooney, Master Car Builder of the Texas Central Railroad, and named by him the Lone-Star car door. The arrangement is well shown in the engraving, and we will let Mr. Mooney describe its points and his claims for it as below:

The object of the "Lone-Star car door" is to secure a perfect fitting door that is storm-and-spark proof, which, as every one knows, is particularly desirable in cars used



Mooney's Storm and Spark-Proof Car Door and Fastening.

for the transportation of cotton and other inflammable commodities.

The door is suspended from the top, the same as all car doors, and the object is to make the bottom flush with the side of the car. This is accomplished by the door posts being beveled from nothing at the top, to a depth of two inches at the bottom. The door is secured in position by a gravity latch, to which the seal or lock can be attached.

Fifty pounds of wrought iron is required, which is 8 pounds less than in the ordinary door; and 18 pounds of cast iron is used, which is 10 pounds less than in the ordinary door.

The device can be applied to the ordinary car door at a trifling expense, and in the construction of new cars or new doors this device can be applied at a less cost than the ordinary door.

Brake Shoes for Street Cars.*

BY D. F. HENRY AND POWELL EVANS.

The opening of this paper briefly outlines the work of the Master Car Builders' Association in establishing standards for steam railroad car construction, and the urgent necessity for some such action by the American Street Railway Association. To illustrate this, an abstract is given of a letter from W. W. Whitcomb, President of the Composite Brake Shoe Co., of Boston, published in the *Street Railway Journal*, which relates an instance where the author was shown, by a truck manufacturing concern, nearly 100 different styles of brake shoes, many of them differing only in some small detail, yet enough to unfit them for any truck except the one for which they were designed. At another truck company's works the manager failed to recognize a drawing of one of their own shoes, made some years before. These may be exceptional cases, yet are examples of this widely existing evil. Roads which use altogether but one style of truck are very few, and consequently for each individual style and make there has to be on hand a supply of shoes made expressly for it and fitting no other, thus multiplying styles at increased expense. A remedy can be found only in the adoption of some standard suitable alike to all makes of trucks and their brake mechanism.

A long abstract is then made of the M. C. B. report of

1893 on the subject of brake shoes, covering the tests made by the Association and the discussion. Then appear extracts from letters from two wheel makers and one brake shoe maker, which give their views on the question of friction between wheels and shoes and the advisability of using soft metal for the latter to prevent heating of the wheels as well as wear.

In round numbers there are on all lines of street railroads in the United States, 50,000 cars, including steam and electric motors, cable grip cars, trail and horse cars. These should not properly be lumped, as they include varying factors of weight and speed, varying the brake services required—but for the result in view, using low averages, this lump figure will be sufficiently accurate.

Assuming an average mileage of 75 miles per day for all cars, including an allowance made for cars used in rush hours only, and others under repair, the total result would be 3,750,000 car miles per day. Taking the average life of brake shoes at 5,000 car miles, and an average of 5 shoes per car, there is a daily consumption of 3,750 brake shoes, and an annual consumption of 1,368,750 shoes. At an average weight of 21 lbs. each, new, the total weight is 28,743,750 lbs.; at 2 cents per lb. amounting to \$574,875. We will deduct from these amounts an

average weight, per shoe, of 9 lbs. when worn out, amounting to 12,318,750 lbs. of scrap at $\frac{1}{2}$ cent per lb., equal to \$61,594, leaving a net balance of \$513,281. This represents what we pay annually for metal actually ground to dust braking our cars. To this we must add the cost of labor in changing the shoes. Allowing 30 minutes per shoe for replacement and adjustment of rods, etc., and \$2 per ten hours' day for labor, this total annual charge would be \$136,875. Adding this last figure to the net cost of metal, gives us the total annual charge of \$650,156 for brake shoes, equal to about \$13.70 per average car, from which you can roughly estimate the cost of this item for your respective roads.

If you select a metal which will give you a greater car mileage than 5,000 miles; or a shape which will permit you to use more of your 21 lbs. of new shoe than 12 lbs. for braking, and, therefore, less than 9 lbs. for scrap; or if your shape is readily adjustable on cars, and your men become familiar with their replacement and save time, a saving results.

Messrs. William Wharton, Jr., & Co., Incor., of Philadelphia, in facilitating the preparation of this paper, sent out 300 circular letters and sets of questions, to which 35 or about 12 per cent. replied.

Then follows a copy of both the letter and the circular, the latter containing seven questions, with several sub-questions, bearing on the subjects of "material," and "shape" for brake shoes.

Of the 35 answering replies: 7 sent no information whatever (1-7); 7 stated they had no records of shoes or wheels, but gave such information as memory supplied, probably; 13 gave records of shoes and wheels—"limited," "not accurate," etc.; 2 had records of wear of wheels, not of shoes, and 6 had records of shoes and wheels.

The small number of these answers first, and the smaller number giving accurate information, second, does not speak well for the interest the members of this Association show in such matters, or the records kept by them. As a whole, the replies are very contradictory.

In our opinion, a standard shape of shoe proper could be put in practical and immediate use. Out of 24 circular replies on this point 22 favored such a plan. The principal objection made to it is that the hangers wear and will not hold shoes tightly for any length of time. Is this not largely due to faulty design, as the Master Car Builders' Association standard for some years has consisted of a separate shoe and hanger?

We strongly advocate the adoption of the Master Car Builders' standard by this Association, the hangers made to fit our various trucks. In time we may hope to reach a standard hanger, when the brake beam and attachment are made from one design.

*From a paper presented at the Atlanta meeting of the American Street Railway Association.

Without further attention to shape, we will proceed to some consideration of material. It seems to be generally conceded that neither chilled iron nor steel is advisable, as they have not a sufficiently firm hold on the wheels and wear them too much.

Soft cast-iron, on the other hand, is satisfactory on both these points, but wears out too fast. Various combinations of soft and medium hard cast-iron, with wrought iron, chilled iron or wooden segments inserted in the frictional face—from 20 per cent. to 40 per cent of the face—have given the best results in all these respects in street railway service so far. The Lappin & Baltimore Car Wheel Co.'s shoes represent the soft and chilled segment type; the Composite Brake Shoe Co.'s shoe, the iron and wood segment type, and the Wharton Co.'s shoe, the wrought and cast iron type. Still another type is the Wharton wood shoe, in which the frictional surface consists of oak cut across the grain. The Pennsylvania Railroad Co. uses a medium hard or soft, if you please, cast-iron mixture for its shoes; but it is well to remember that the pressure of the shoe against the wheel, and the circumferential velocity of the wheel, is much greater in steam railroad practice than in ours, and the former could not use at all with safety material which might do our work.

A chilled iron shoe would burn their wheels, and a wooden shoe would be set on fire. Another point of difference in conditions of the two practices is the normal freedom from dirt and grit on the steam track, and the necessary presence of both on all tracks laid in city streets. This grit undoubtedly increases the frictional coefficient between the wheel and the shoe on street cars, but also tends to increase the grinding of both.

A. Whitney & Sons, of Philadelphia, have designed a shoe having open cuts across the frictional face, to permit this grit to fall out. As the area of the frictional face must necessarily be as great as in others of continuous surface, they practically apply a number of small shoes instead of one large one, and the total amount of grit retained by the former type is probably equal to that retained by the latter, so we cannot see any actual difference in result in this respect between the two. The grit is always with us, and must be considered an ineluctable factor in our problem. In connection with the area of frictional surface, the best practice seems to be for the shoe to be not less than twelve inches long, and to rub on both the tread and flange of the wheel.

The paper closes with another urgent appeal to the Association to recognize the work done by the M. C. B. Association, in the matter of standards, and also suggests the appointment of a committee to investigate the subject during the coming year, to make experiments, if deemed advisable, and to report at the next Convention. A sum of money should, in the opinion of the author, be appropriated by the Association for their use. As an example of the work of the M. C. B. Association, the experiments on brake shoe material now in progress at the works of the Westinghouse Air Brake Co., are mentioned, followed by some reprinted correspondence relating to these tests.

The Archer Avenue Subway in Chicago.

As mentioned in the *Railroad Gazette* of October 5, the elevation in Chicago of the tracks of the Lake Shore & Michigan Southern and the Chicago, Rock Island &

Archer avenue being, by reason of the conditions there encountered, the most expensive and difficult of any along the line of the tracks to be elevated. Through the courtesy of Mr. L. H. Clark, engineer in charge of this work, we are enabled to show the accompanying plans of this subway.

Archer avenue has at this point a width of 80 ft., with

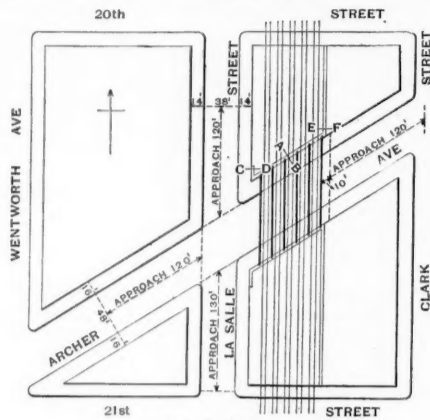


Fig. 1.—Plan.

16 ft. sidewalks, and is crossed by the five tracks of the two companies at an angle of 58 deg. 12 min. Fig. 1, shows the location of this crossing and gives some of the details of the subway, the length of approaches, etc., all of which are prescribed by the terms of the ordinance under which the work is being carried on. The ordinance also limits the depression of the avenue to 4 ft., and requires the gradient on Archer avenue to be not over 3.5 per cent., and on La Salle street not over 3.25 per cent. A clear head room of 12 ft. is also required. Fig. 2 shows sections of the abutments and retaining walls at the points indicated on Fig. 1. These are to be of first-class cut stone masonry on concrete foundations.

Fig. 3 represents, in its full length, the structure across Archer avenue. The distance between the abutments under the coping is 94.71 ft., the length of the center span 60 ft., and of the end spans about 19 ft. The roadway is to be paved with a course of vitrified brick laid at right angles with the curb lines, and resting on a solid foundation of hydraulic cement concrete 9 inches in depth, solidly tamped and properly crowned. The curbs are to be of sound, hard limestone, of standard dimensions and finish, and the sidewalks of Portland cement concrete.

placed just outside the curb line. These columns also carry one end of the short girders over the sidewalks, the other end resting upon cast iron bed-plates, which are bolted to the top of the masonry abutments. The ends of the sidewalk and roadway spans are riveted together, where they adjoin over the columns, through their vertical end stiffeners, and are together supported upon a cast iron block, placed on the column top plate, the thickness of the block being such that the flooring at this point rests upon the column top plate to which it is riveted. The girders are bolted to the column tops. The columns are carried upon stone piers built up from concrete foundations below the surface of the street, the piers being carried slightly above the sidewalk at the curb line.

It was originally the intention to make the sidewalks several feet higher than the roadway, and this, it would seem, could easily have been done, making very little, if any, depression in the sidewalk, and still allowing plenty of head room for foot passengers. This was contemplated in the ordinance, as is shown by the clause prescribing a minimum head room above the sidewalks of 7½ ft., with a minimum headroom over the roadway of 12 ft. The Commissioner of Public Works, however, required that the grade of the sidewalks conform to that of the roadway as we have indicated.

The floor is of trough section as shown in Fig. 4, and is built of flat plates and angles. Its depth is 10½ ins., and the distance from center to center of corrugations, 21 ins. The top plates are 1½ by 10 ins. in section, the bottom plates 1½ by 11½ ins. in section, and the side plates ¾ by 9½ ins. in section. The angles are 3 by 3 by ¾

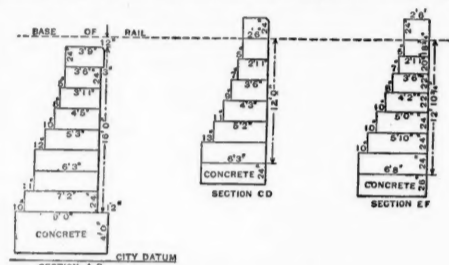


Fig. 2.—Sections. (See Fig. 1.)

in size. The flooring lies between the lower flanges of the girders, with a clearance of one in. at each side for drainage. Its under side is level with the under side of the lowest cover plate. It is supported at each side by means of short angles riveted vertically to the web of the girder, with short gusset plates connecting the projecting

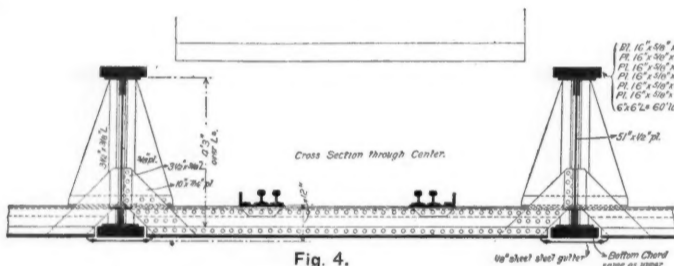


Fig. 4.

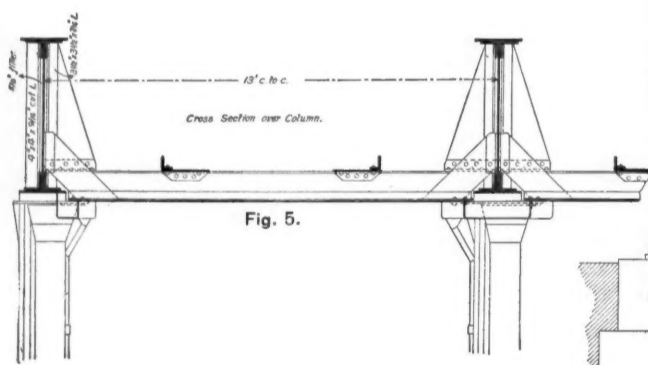


Fig. 5.

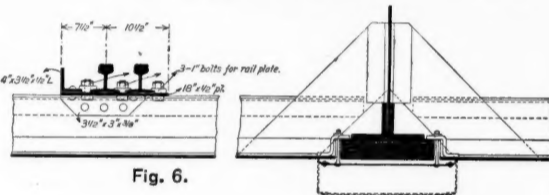


Fig. 6.

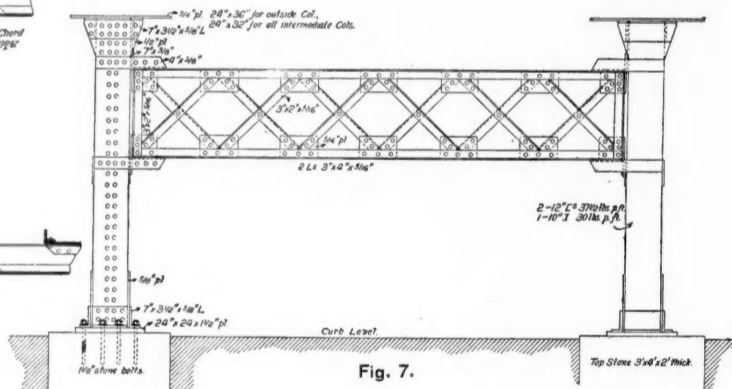
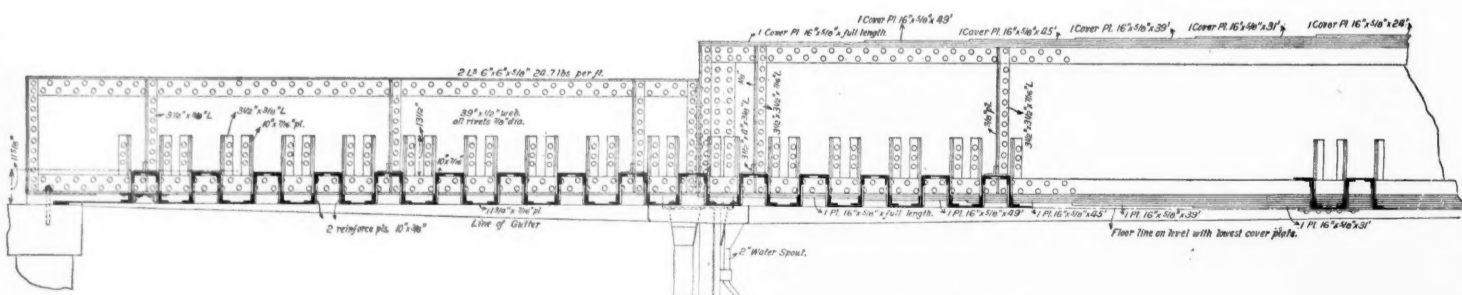


Fig. 7.



Lake Shore Track Elevation in Chicago—Archer Avenue Crossing.

Pacific companies is now well under way, the two companies having commenced work on the first section, from Sixteenth to Twenty-fourth streets, several weeks since. Within this section subways are located at Archer avenue, Twenty-second and Twenty-third streets, that at

The superstructure or bridge over this subway is of the plate girder type, with shallow corrugated floor. As before stated, the roadway spans are 60 ft. in length, and the sidewalk spans about 19 ft., their length varying slightly. The roadway girders rest upon steel columns

eg f the angle too the side plates of the floor. Each side plate is supported in this manner, and the floor receives an additional support from gusset plates connecting vertical stiffeners of the girders with the top plate of the corrugation opposite. The gusset plate is connected

with the top plate by two angles. The short girders have three such connections, while the long girders over the roadway have four connections with the flooring. There is also at each end of the long span and at two intermediate points, a connection made between the under side of the flooring and the lower chord plate by means of a $\frac{1}{8}$ in. plate. A similar connection is made with angles at the ends of sidewalk spans near the abutments.

The floor finishes up at each abutment as shown, with a plate of sufficient size to cover the opening between the last corrugation and the abutment, the plate resting upon a $\frac{1}{2}$ in. wall plate in order to clear the heads of rivets.

Under each rail is a rail plate 18 ins. wide, which is secured to the flooring by means of angles riveted to each vertical plate of the flooring and to the rail plate itself. A $\frac{3}{4}$ by 4 by $\frac{1}{2}$ in. angle iron serves as an outside guard rail, and a rail of standard section is used for the inside guard rail.

Gutters are placed under each girder, each of sufficient width to catch the drippings from the flooring at each side, except at the outside girders, the gutters being about 1 in. deep at the center of the long girders and in-

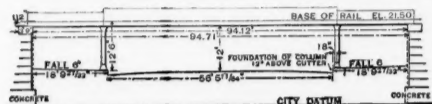


Fig. 3.—Section Across Avenue.

creasing in depth down to the column where a 2 in. pipe is to carry the water to the gutter of the street. A similar gutter is placed beneath the short girders and carries water to the curb line to meet the gutters under the cutter.

Between the first, third and fifth bays or spaces between the columns is placed a system of bracing as shown in Fig. 7.

The Lassig Bridge & Iron Works, Chicago, have the contract for the iron work of this subway and are to have the structure for the two east tracks in place within a short time. All other work is being done by the roads interested. The superstructure of this bridge was designed by Mr. Albert Lucius, of New York City.

An English Achievement in Excursion Traffic.

The special excursion business which is done every year for the Doncaster races, surpasses everything else of the sort in England, both in number of trains and in concentration and rapid handling of traffic. The race-meeting lasts for a week—usually the second in September—but by far the busiest days are Wednesday and Friday, especially the former, when the famous "St. Leger" race is run. On that day every year from 50,000 to 60,000 excursionists from all parts of England are brought into the town by rail in the morning and carried away again at night. The special trains, of which this year at least 130 were run, are contributed to by all the leading railroads which serve the northern parts of England, but they all unload and reload their passengers—which average 400 to each train—into a single station at Doncaster which is owned by the Great Northern. This station is on the Great Northern trunk road, between London and York, and it is also the center to which converge six other important lines which have running powers into Doncaster station. The station is also the site of the Great Northern Co.'s locomotive and carriage shops, and the marshalling center for the heavy mineral traffic from the Yorkshire collieries to the South. This means that there are around the station many acres of side-tracks, which for 51 weeks in every year are used by locomotives and cars awaiting repairs or as marshalling ground for loaded and empty coal wagons. During race-week the shops are closed, and stock that can still roll is sent down the line to some other refuge; coal and freight wagons are despatched to their destination, and no new trains are allowed in to fill their places; and thus at very little expense the Great Northern obtains an area of side tracks sufficient to accommodate the greatest number of trains which on St. Leger day can be poured into Doncaster from all the eight converging lines.

Drawing a circle of a radius of say 80 miles, with Doncaster at its center, it would be hardly possible to find within the very thickly populated area thus enclosed a single place of sufficient importance to have a railroad station which is not served on St. Leger day by at least one "special excursion" train. All the towns of importance—and there are at least 50 such within the above named area—are served by at least half a dozen "specials," and not a few have the choice of a dozen or more different trains. Moreover, many of the excursionists are brought from nearly double the distance named, as, for instance, those from London, which is 150 miles away, and these, after being allowed five or six hours to see the races, are carried back home within sixteen hours at most from their start in the morning.

Passengers by the bulk of the trains are conveyed at "excursion" rates, which are usually the single third-class fare for the double journey, or, roughly speaking, 1 cent per mile. Some of the "specials," however, are what are known in England as "additional" or "duplicate" trains, and for these, as a rule, the ordinary class fares are charged. The same rule, of course, applies to the ordinary trains which are usually "strengthened" at these times with additional cars.

Altogether, on last St. Leger day, Sept. 12, between the

hours of 8 a. m. and 1 p. m., 72 special and 13 ordinary passenger trains entered Doncaster from the South, and 58 "specials" and 18 ordinary from the North, making a grand total of 160 trains, at least 130 of which had to find terminal accommodation at Doncaster, so that they might be ready to start on their return journeys in the evening. The majority of the excursion trains do not draw up to the station platforms, but are run directly into the siding, whence they are to start at night, the excursionists alighting there and returning at night to the same place.

As all the trains at first come in on the rails opposite to those on which they must depart at night, there is considerable switching done, but with experienced inspectors and flagmen, this work is safely done, provided the special instructions laid down as to block and single line working are observed.

About 4:30 the exodus begins, and from 5 o'clock to 7 trains are despatched at about the rate of one every minute and a quarter, while in all about 160 trains, including the ordinary through traffic, are got rid of by 9:15 p. m.

It may interest American railroad men to know more in detail the arrangements which are made by English officials to handle traffic of this special character. Setting aside the important business which devolves on the passenger agents in the issue of bills at every station, advertising the special facilities to be afforded to excursionists, it may be said that the first proceeding of moment consists in a preparation of a "special and additional working time table," a copy of which is supplied to, and must be read carefully by "every station master, clerk, inspector, engine driver, guard, signalman, gager, foreman, shunter, brakeman, yardman and gateman, and also porter connected with the working of the railway." In the case of the Doncaster race arrangements for this year the special time table consisted of no less than 47 closely-printed folio pages. At Doncaster itself, important preliminary precautions have to be taken. Three additional block-signal towers are erected, and nine other towers, which are ordinarily closed at night, are ordered to remain open on the special days in the race week until all passenger trains have passed. In some cases additional signalmen are provided, and also additional telegraphists, who are instructed to transmit special messages to and from various points announcing the departure of trains. Further, 30 flagmen are stationed at various points around the station to protect traffic in and out, each being supplied with a complete set of hand and detonating signals. Plate layers are also provided to attend crossing-gates and to assist engine-drivers in and out of the side-tracks, and to hold the points. To protect the transfer lines admitting to the sidings, additional signals are erected, and, to ensure safety in the shunting and marshalling operations, the approach line to each group of side tracks is worked as a single track on one absolute block system, and no train is allowed to pass over these lines unless the inspector in charge of the section is present and gives permission.

On the St. Leger day no freight train is allowed to arrive at Doncaster between 7 a. m. and 9 p. m., or to leave between 8 a. m. and 9 p. m., except as specially provided, and no train of empty carriages is worked in between 10 p. m. Tuesday and 10 p. m. Wednesday. Every effort is made, also, to work fish and freight trains through Doncaster without delay. Moreover, "through car working," i. e., the transfer of cars from one train to another without causing passengers to change, is suspended at Doncaster throughout the week, and no vehicle, whether occupied by passengers or not, which requires transfer from one train to another at Doncaster, must be sent on Wednesday or Friday by any train arriving there after 10 a. m.

The arrangements made for the guidance of passengers to their proper trains at Doncaster are very extensive. First, every passenger "booked" by excursion train on the two special days, receives, when he takes his ticket, a small printed notice, giving information as to the side track at which the train will arrive and from which it will depart, and naming the precise time of departure. Next, two labels of an agreed pattern are posted on each side of each carriage (i. e., compartment), and larger labels are placed on the front of the engines and on the ends and sides of the brake-vans of each train. These labels state the stations to which each train conveys passengers. Moreover, the engine of each train starting from the locomotive sidings, where there are fully 40 tracks, carries in front and also in the rear of its tender, a number corresponding to the number which is placed close to the side track set apart for that train to depart from. Conductors are ordered to be in attendance with their trains from an early hour in the afternoon, and a large staff of porters is also provided to direct the excursionists when they pour in from the race course.

During the busiest times no trains are allowed to pass through Doncaster without stopping, except one or two very special ones, and these must not exceed a rate of 10 miles an hour through the station yard. This year the whole of this most congested traffic was successfully handled without a mishap of any kind.

LONDON, Sept. 25.

City and Suburban Electric Railroads.*

BY E. C. FOSTER, Superintendent, Lynn & Boston Railroad.

As a road is projected and studied from a financial point of view first, then constructed, and then operated, it may be well to consider these topics in this same

*Extracts from a paper read at the Atlanta meeting of the American Street Railway Association.

order. The first point, covering the work preliminary to the construction, admits of nothing but rather general discussion. For roads connecting towns, it is often possible to secure an independent right of way for a very slight cost per mile, and very often for nothing. Progressive land owners are often willing to give the necessary land for an electric railroad, and oftentimes to contribute something toward the grading. If, in this way, the right of way can be obtained that is desirable as to route and grade, it offers many advantages that cannot be had on public highways. For such a right of way the regular steam road form of construction would be employed. About a 60 lb. T-rail, 6x7 in. oak or chestnut ties, laid 2 ft. centers, needle switches with lever throw, etc., would give a track that would allow a speed of 40 miles an hour, making it necessary to slacken speed only for curves, and as much for switches as the overhead construction demanded, the track switches requiring no reduction of speed. Curves, in such a road, should be few, and of the longest possible radii.

Where it is decided to build on country roads, a location at the side of the road is preferable. Here T-rails may be laid, and the track filled with gravel, covering the ties and leaving the heads of the rails entirely exposed.

In the streets of smaller towns, where permission can be obtained, it is also desirable to lay T-rails, although there is always more or less trouble maintaining the paved brow that is usually required, and consequent difficulty in plowing snow from the track, due to the shears and diggers of the plow striking the partially displaced blocks.

In paved streets the girder rail seems to be the only one suitable. In order to obtain the necessary depth for paving, this rail should be 9 inches deep, and should weigh about 90 pounds per yard. While such construction is necessary, where laid in streets paved from curb to curb, it is an open question as to what is best in macadam streets. There are many lines that are operated on 15 or 30 minutes or even on hourly intervals, where the business is hardly such as to warrant the use of track construction costing from \$20,000 to \$30,000 per mile. The frequency of the service is an important factor in determining the most economical construction for use under particular conditions, and I think that the 9 in. girder rail becomes a luxury when the number of cars run over it daily is reduced below a certain figure. Further, there are positive objections to the use of such rigid construction as this in dirty streets, as in macadam streets, where the top dressing contains a great deal besides stone. My experience has been that the rail becomes covered with dirt, and that the cars rattle and "chatter" badly in running over it, more than in running over a dirty rail of less rigidity. It may seem revolutionary to suggest that, for certain places, it is worth while to consider relaying good tram rails, using some approved form of joint plate. I am not quite convinced in my own mind that there are conditions existing where this is warrantable, but the subject is certainly worth consideration.

Regarding equipment, the longest car that can be operated successfully on four wheels is the most desirable for the ordinary conditions. For long distance lines having heavy traffic, I would recommend 30 ft. bodies, on double trucks, for box cars, and 15 bench, open bodies, on similar trucks. Where there is a sufficient demand, a combination smoking and baggage car should be run as the trail car of a train of two.

In building a new road for short distance travel, all curves should have the necessary radii for the use of 7 ft. wheel bases through them, and have trucks this standard. On these trucks should be mounted 20 ft. box cars and 10 bench open cars, either class measuring about 29 ft. 6 in. over the buffers. As a supplement to the regular equipment of motor cars, trailers may be run economically, as a power brake is necessary. The air brake is being developed for street car use, and promises to fill the requirements. For convenience in attaching trailers to motor cars, automatic couplers are necessary. There are several forms of latch couplings that can be made to do the work satisfactorily. An important thing in connection with the use of trailers is the adoption of, and adherence to, a standard, that all buffers and drawbars may be of one height, and other parts right for the proper operation of cars in trains.

For electrical equipment, the modern multipolar, single reduction motors, with series-parallel controllers, are the only ones that a road can afford to use. The results so far obtained from electric heating seems to indicate that this method cannot be depended upon in all cases. Our experience is that it takes from eight to twelve amperes to keep a 20 ft. car comfortable, that is, 40 degrees above the outside temperature. This means that it requires about as much current per hour as to propel a car four miles. This would make 72 car miles of power per day of 18 hours, chargeable against the heaters. When it is considered that this extra power is often needed for other purposes, as in snow storms, it may be seen that, aside from the question of cost of coal, the consideration of the necessary increased capacity of the power station and feeder system is an important one. Having put myself on record as opposed to electrically heated cars, it is probably expected that I present a method that is satisfactory. Unfortunately, though, I am unable to do this. For short trips, run from a car house, the hot water storage system may do.

[Mr. Foster discusses at some length the method of fixing a system of fares, but this we omit for lack of space. It is good literature, however, on that special subject.—EDITOR.]

Suburban roads work at a disadvantage compared with city roads, when the question of operating expense is considered. In the former case a large number of cars may be cared for in one car house, thus allowing a minimum expense of maintenance. A small car house cannot afford the motor tables, traveling cranes, etc., that do so much to lessen the cost of motor and truck repair, nor can the work of the small house be divided among different men, giving each his specialty. In one of the largest car houses in the world, the Lenox street house of the West End street road, of Boston, two men fill all grease cups, examine and replace brushes, and inspect other parts of the motors of from 120 to 150 cars daily. The other work in the house is divided up among some 20 men, including carpenters and blacksmiths, so that the average is about six cars per man. This number of cars per man is often assigned, but probably the work is seldom so well done as in this house. Another important disadvantage under which the suburban road labors is that of the high cost of power. It is usually dependent upon a number of small stations, due to the fact that it is impossible to cover the necessary territory from one station; both the labor and coal consumption of small stations are necessarily greater per car mile than are those of large ones. The opportunities of making the expense in the first instance, that of car house work, compare favorably in the small house with the large are rather few. They lie in the dependence upon one capable man, directing the efforts of lower priced labor. Another idea that suggests itself is the equipping of one house with a complete outfit of labor-saving appliances

safe and reliable means of quick transit, business enough will surely be offered to at least reasonably compensate the capital invested." Probably even this is not a safe general proposition, but we will not stop to discuss it now. What follows is Mr. Stuart's language.]

Hence the elevated railroad engineer of to-day is required to address his energies to ascertaining and adequately providing for every possible requirement which may be demanded by the traffic, with the least possible cost for maintenance and operation, without special consideration for the first cost necessary to secure these results. These abstract statements will have a clearer meaning after reducing them to figures in a single instance relating to elevated railroad stations. With few exceptions, the stations on the Manhattan lines in New York are located outside of the two tracks, thus requiring duplicate buildings and attendance at each place, whereas, if they had been located between the tracks, each of these two items of expense would have been reduced about 50 per cent. For the year ending June 30, 1893, the average cost of maintenance and station service per station, was about \$3,500, hence the following comparison may be drawn between stations located in the two ways mentioned, viz.:

	Inter-track Station.	Outside Station.
Original first cost.....	\$15,000	\$25,000
Capitalization of annual cost, 5%.....	70,000	140,000
Totals.....	\$85,000	\$165,000

This indicates that a saving in capital account of \$80,000 per station could have been effected by locating all stations between tracks, in lieu of outside, and as there are nearly 100 stations so located, about \$8,000,000 could, if necessary, have been profitably expended in so designing the structures as to make possible the adoption of inter-track stations. This sum represents fully 50 per cent. of the amount which would be required at this time to duplicate the entire structures and equipment owned by the Manhattan Company. The above figures are based upon items covered by the report of this company to the Railroad Commission of the State of New York, and upon the writer's experience in 1893, during the construction of some new lines for the Brooklyn Elevated Railroad, hence are not founded on mere speculative inquiry.

Though the elevated railroad has not so fully solved the problem of rapid transit as was expected and hoped for, yet it has, in the matter of safe transit, approached more nearly to perfection than perhaps any other mode of travel yet employed. The eleventh annual report of the Railroad Commissioners of New York contains some convincing figures covering this point, which are here appended:

Name of Line.	Number Passengers Carried.	Number Employees	Persons Injured or Killed.	One Inj. or Killed in
Kings County El.	18,544,033	550	3	6,181,344
Brooklyn El.	3,110,376	1,042	10	3,811,037
Manhattan.....	221,407,197	5,193	46	4,813,200
New York Cen.	23,671,383	27,732	1,562	15,150
Brooklyn City (Surf. Line)	83,196,302	4,300	49	1,700,000

Whilst it is not altogether fair to exhibit the steam surface roads in such a comparison, yet it brings out by strong contrast the statement that elevated railroad travel is at least relatively safe for both passengers and those employees who are engaged in train service.

This remarkable record has been accomplished not without much close and painstaking study of all the details of construction and operation, and among those simple expedients contributing to this immunity from injury to persons may be mentioned the removal of the usual car step and building the station platforms on a level with the car platforms. The most fruitful of all the sources of injury to passengers is falling off or being pushed off of the station platforms on to the track. It has been attempted to obviate this danger on the Manhattan lines by building a railing along the edge of the platforms on the track side, with openings left in it at intervals of a car length apart. The writer is of the opinion that this railing introduces two sources of danger, either of which is much greater than the one it seeks to remove. The crowding of impatient passengers is thus confined to, and concentrated at, these openings, enhancing the probability of some being forced off, and makes it almost positively certain that passengers who attempt to board a train before it stops or after it starts to move, will be severely injured or killed by being crushed between the railing and the moving train. A number of accidents growing out of these causes and coming to the writer's knowledge, have confirmed and justified this belief. Furthermore, they cause much loss of time in making stops, through difficulty of stopping trains just at the right point.

A few years ago people had not discovered that the elevated railroads did not furnish them real rapid transit, but since the introduction of the "trolley" into Brooklyn, this fact has been made apparent to many, and is evidenced by the large decrease in travel on the lines of the two elevated companies in Brooklyn. Whilst the surface lines give better service and somewhat quicker transit than before electric power was introduced, yet the latter gain is not, and cannot be pronounced enough to justify the loss in traffic on the elevated lines. It does, however, specially emphasize the fact first stated, that the latter do not give the quick transit hoped for, and which should be expected of them. Since the trolley

came, the Brooklyn elevated lines have increased their speed to about 14 miles per hour, but the New York lines still adhere to a speed of 12 miles per hour—ridiculously low speeds, it must be conceded, for trains drawn by locomotives.

Distances have become so great in New York and Brooklyn, over which a large travel must pass, that greater speed has become not only desirable, but almost imperative for the economic conduct of business. Its acquirement has been the subject of much study recently, and as an aid to the investigation of the facts involved, the writer has made some observations on a number of trains of the Brooklyn Company, the results of which are shown in some tables hereto attached. From them it will be seen that, of the total time occupied between terminals, 25 per cent. of it is used in acquiring full speed from a state of rest, 39 per cent. is used in running at full speed, 13 per cent. is used standing at stations, and 23 per cent. is used in retarding the speed to make the stops. The time required to load and unload passengers cannot be definitely controlled, and is now probably at a minimum, hence any change sought in the average speed must be found in reducing the time occupied in accelerating and reducing speed, in an increase of the speed while in motion, or in three items combined. Such requirements suggest greater braking power and heavier engines, and the latter suggests the inquiry as to whether the structures will safely bear any greater wheel loads. Investigation answers the latter question in the negative, and especially emphasizes it if greater speeds are to be maintained. Under present conditions, a maximum running speed of about 25 miles per hour is required, which, so far as danger of derailment is concerned, could easily be increased to 35 miles, but the increase in weight of engine necessary to secure this requires all the higher braking power to make the stops quickly, particularly when the trains are short and relatively light with respect to the engine. It follows as a logical sequence, that frequent stops must entail a wasteful and extravagant use of energy, and it is equally manifest that any increase in speed opens still wider these leaks. The appended table, which has been compiled from the last annual report of the Railroad Commission of New York, will illustrate the extent of this waste, by contrasting the elevated lines in New York and Brooklyn with the New York Central Railway, in the matter of cost of motive power.

SOME STATISTICS OF ELEVATED RAILROAD OPERATION.

Item.	Manhattan Elevated.	Brooklyn Elevated.	Kings Co. Elevated.	New York Central.
Total cost per train mile.....	64 cts.	38 cts.	48 cts.	76 cts.
Total cost per car mile.....	12.8	13.8	.14	12.7
Total cost per ton mile.....	0.67	0.73	0.73	0.38
Total cost per train mile for motive power only.....	23.5	18.0	21.3	22.1
Total cost per ton mile for motive power only.....	0.24	0.34	0.32	0.11
Cost fuel per engine mile.....	9.81	8.17	10.36	8.90
Cost labor per engine mile.....	8.58	6.81	8.07	6.60
Cost repairs per engine mile.....	3.27	1.39	2.04	4.20
Coal burned per engine mile.....	54 lbs.	37 lbs.	46 lbs.	18,544,033
Passengers carried.....	221,407,197	38,110,376	18,544,033	1,047
Pass. cars in service.....	1,047	230	145	334
Locomotives in ".....	334	76	44	35 miles.
Miles structure oper.	35 miles.	17 miles.	7.5 miles	

It will be seen that it cost 80 per cent. more per ton mile for train service on the Manhattan Elevated lines than on the New York Central, and for motive power only the disparity is much greater. There is no cause to which this wide difference can be traced except the frequency of stops on the elevated lines, and as this item of expense is already one of great proportions in the operation of the elevated lines, this fact admonishes great caution in taking any steps which would certainly make it more burdensome.

The question of acquirement of greater average speed on elevated railroads is a very important one, inasmuch as their future success seems to depend upon it from a financial standpoint, but in view of the several serious obstacles which have been noted above, there is grave doubt as to whether the problems presented are to find a solution in the locomotive. These considerations have suggested some investigation and inquiry as to the probable cost of electric traction under similar conditions, and from such data as have been available, it is believed that this form of energy will be as efficient in solving the problem of rapid transit on elevated railroads as it has been in improving the speed and service on surface railroads. It is the ideal power for the attainment of high speeds.

In some respects, excessive grades and curvature are quite as objectionable on elevated railroads as a long experience has shown them to be on surface roads, though this fact seems not to have been appreciated by the designers of the earlier elevated structures, as we find many grades on them which act as perpetual barriers against the economic use of power, and for whose existence we can find no logical reason. This is particularly true on some of the lines of the Brooklyn company, built as recently as seven or eight years ago. In most instances they could easily have been avoided by a slight increase

in first cost of structure, but there was one of especial interest on an important line of that company, where a grade of less than 1.25 per cent. was not only practicable, but possible to secure at less first cost than the 2 per cent. grade which was actually adopted and used. From considerations of economy in operation, the work of readjusting this grade was undertaken and successfully accomplished, during the summer of 1893, by lowering the structure varying amounts from 3 ft. to 5 ft. 7 in., over a distance of about 1,300 ft., with trains passing over each track about six minutes apart, and at a cost of less than \$6,000. In view of such instances of egregious blunders, which are by no means infrequent, it is not strange that the profession should at times be discredited by those who employ engineering talent to direct economic investment of capital.

Among the annoying features connected with the operation of the elevated railroad, may be mentioned the freezing of supply and waste pipes at stations in severe weather. This is always attended with inconvenience and much expense for repairs, hence a new method of dealing with the problem of its prevention, was adopted on the extensions to the Brooklyn elevated lines which were completed and opened for business in 1893. Wrapping the pipes was never wholly effective; hence it was conceived that by using the hot water system for warming the stations, in lieu of stoves, the portable heat thus available could be utilized in preventing the supply and waste pipes from freezing by running hot water pipes along with them to the ground. As some novel condition, arose in this use of the hot water system, a description of the apparatus installed at Sixty-fifth Street terminal station, in South Brooklyn, may be of interest, and it will here be stated that this system was employed in preference to either high or low pressure steam, because of its greater safety, simplicity and economy in operation. When first proposed, most of the firms who were invited to bid on supplying and installing the apparatus pronounced it impracticable to secure circulation in the three loops of pipes which were run with the three sets of supply and drainage pipes to the ground, both because of their widely separated location and the height to be overcome. Theoretical considerations suggested it, and experiment confirmed the conclusions thus reached, that by sufficiently elevating the source of hot water supply, the static head thus created would overcome the greater specific gravity of the cooler column of return water in these loops, and hence maintain a circulation in them. In this lies the solution of the only difficulty to be overcome in such use of hot water apparatus. Some prints are attached hereto, showing features of the piping at this station, and by a reference to them the following description of the heating plant will be made clearer. The heater is placed in a sub-story built under the dispatcher's office, from the top of which rises a 4-in. hot water pipe to the top of the signal tower, where it branches into two 3-in. pipes. One of the latter supplies hot water for warming the several buildings, and for protecting from frost two of the clusters of drainage pipes above referred to, whilst the other supplies hot water to protect the engine water supply and to prevent freezing in the ash pans the waste water which drops into them along with ashes drawn from the engines. All radiators are composed of coils of 1½-in. iron pipe hung to the walls of the rooms, and each is provided with a gate valve to regulate the distribution of hot water, it being impracticable to so gage the sizes of pipe used as to accomplish this without their aid. After manipulating these valves so as to obtain uniform temperature in all of the rooms, their stems were cut off to prevent any malicious or careless tampering with them afterward. Each room is provided with one square foot of radiating surface for each thirty cubic feet of volume to be warmed, and, though this is about twice the usual allowance, it is found to be none too great, owing to the exposed situation.

At a point 175 feet from the heater, a 4-in. cold water pipe is run from the ground, above and across the three tracks on a small iron bridge, to supply engines with water. While taking water, the locomotives also have their ashes drawn, and to provide a receptacle for the latter, boiler plates ¾-in. thick are riveted to the top flanges of the longitudinal girders, being bent down between the girders to form five water tight pans 52 ft. long. To prevent the water and ashes which fall into them from freezing, coils of 1½-in. hot water pipes are run under each pan and protected from the air by wooden boxing below the pipes, thus forming a series of five chambers under the pans. The 3-in. hot water pipe from the heater first passes up and across the bridge, along with the 4-in. cold water pipe, and descends to the level of the pans, when it branches to supply the coils under the latter, one branch continuing with the cold water pipe to the ground, for its protection from frost. Valves were used on these branches to regulate the flow of hot water through them. The coils under the pans contain one square foot of radiating surface for each twelve cubic feet of volume in the five chambers, but in very severe weather this would scarcely prevent freezing, a deficiency easily supplied, however.

An expansion tank, with automatic feed, is placed in the top of the signal tower and connected with the bottom of the heater through a 1-in. pipe. Its only office is to receive the expansion of the water in the entire apparatus, and to supply any loss of water from leakage. The circulation in the three drop pipes has been all that could be desired, and the entire apparatus has been very successful in operation during the past winter.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contract for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

It has been obvious for some time that the gross earnings of the railroads for September declined again after the slight gain in August. The *Financial Chronicle* in its last issue publishes returns from 129 railroads which give an aggregate decrease of \$2,878,000 or 6.22 per cent.; the year before the decrease had been almost 10 per cent., as compared with 1892. But there are two special circumstances which mitigated this showing a good deal. The month had one less working day than in the preceding year, and the falling off in passenger earnings on some of the roads was very important, and on many of them was serious. The *Chronicle* has been able to get separate figures of passenger earnings for some of the roads most affected; not, however, for the Illinois Central. The decrease in the earnings of the Illinois Central was about \$636,000; what part of this was in passenger earnings we do not know, but we do know that it was big. The Atchison lost \$752,000; its loss in passenger earnings having been a little over \$400,000. But the Atchison is suffering from peculiar conditions and a good many of its stockholders are regretting that the receivers will not pay rebates. The Rock Island lost in all \$596,000, and in passenger earnings \$460,000. The New York Central lost \$325,000, but the loss in passenger earnings we do not know. The Chicago & Grand Trunk lost \$318,000 and its loss in passenger earnings was \$312,000. The Wabash lost \$222,000 in all and \$205,000 in passenger earnings. The St. Paul lost \$214,000 in all and \$328,000 in passenger earnings; that is, it gained in freight \$114,000. The *Chronicle's* comparative tables are carried somewhat further, but these are the heaviest figures. When it is all said there will probably remain some aggregate loss on freight. Among the conditions causing this, several important ones are mentioned. The grain movement, for example, was much smaller than in the preceding year; the receipts at the principal western markets were 12½ million bushels less than in the preceding year, being a little over 44½ millions. The falling off in flour and in wheat was not great, but in corn the receipts declined from 16.7 millions to 7.1, and in oats from 15.9 to 9.1. The Louisville & Nashville, Missouri, Kansas & Texas, Northern Pacific, and the Norfolk & Western all show gains in gross of over \$100,000. For the calendar year up to the end of September 30, the loss in gross for 122 roads amounts to \$50,809,394, or 13 per cent. In the preceding year it was \$2,230,238, a little over one-half of 1 per cent. The southern roads are doubtless feeling the influence of the large cotton movement, the receipts at southern ports having been for the month 505,000 bales against 370,000 the year before and 402,000 in 1892. The southwestern roads show a good improvement in business; some of these doubtless from a heavy movement of corn and others from special conditions; as for instance the Denver & Rio Grande, which earned in September \$635,000 against \$558,000 last year; but in 1892 it earned \$826,000. That is, it is recovering this year from its tremendous loss in 1893.

Another United States Judge has delivered an opinion on railroad men's wages. It is Judge Woolson in the United States Circuit Court at Omaha, who, according to the press despatches, has refused to au-

thorize the receiver of the Omaha & St. Louis (the Omaha Division of the Wabash) to make certain reductions of wages which the operating officers of the road had proposed. As reported, the decision says:

"The doctrine laid down in the recent decision of Judge Caldwell, that 'employees must be paid fair wages, even though no dividends may be paid,' must govern. A comparison between the wages paid on the Omaha & St. Louis and those on other roads running through the same kind of country shows that the former are not in excess of the latter excepting in two branches of the service. The receivers show that a large number of railroad men are out of employment, so that the places could be filled for less money. The court cannot regard this as having much weight. The retention of faithful, intelligent and capable employees is of more importance than a temporary decrease in earnings, and the Court would not be justified in discharging satisfactory employees because of present ability to employ others at reduced wages, thus perhaps, rendering the road liable to accidents for which the Court would be legally and morally responsible. If the wages are not greater than other roads running through the same country the reasons for a reduction should indeed be weighty. The evidence shows that some employees are hardly able to maintain their families on the present wages. The highest and best services cannot be expected from men compelled to live in a state of pinch and want. The receiver suggests that the wages of local freight engineers be reduced from 5 cents to 4 cents, and that those of local firemen be reduced from 2.7 cents a mile to 2½ cents. The Court orders that the reductions be, on engineers to 4½ cents, and on firemen to 2.4 cents. The petition of the receivers will be overruled except as to those two particulars."

Judge Woolson, it will be seen, follows the general line of argument set forth by Judge Caldwell in his well-known decision reversing the action of the Union Pacific Receivers, as reported in the *Railroad Gazette* of February 9, and April 13 last. Judge Woolson, however, seems to have taken a much more temperate view of the subject and to have investigated the facts with more care. Presumably, therefore, the Judge may be right and the Receivers wrong, in this case; while, as we said at the time, the evidence in the Union Pacific case seemed to show quite clearly that the Judge was wrong and the receivers right. But aside from any question of the merits of one case or another, these decisions bring into prominence an important question regarding the management of railroads by Receivers which will some time have to be settled; the question how far a Judge, however wise he may be as a jurist or however upright as an arbitrator, shall enter into the details of railroad management. There are instances enough no doubt, where a Judge appoints as Receiver whomever the most powerful litigant recommends, without knowing much as to the candidate's qualifications for the grave and delicate duties of a railroad manager; and, in the nature of things, there must be Receivers of generally good qualifications and high character who yet will make a mistake now and then in dealing with employees; but in spite of all this it is by no means certain that transferring the responsibility of detail management to a man of legal training will cure the evils alluded to. The simple and natural rule would seem to be for a court to secure the most skillful, high-minded and impartial Receiver possible and then let him manage the road as though he were its president. There would still be occasions enough for any Judge to use all his railroad knowledge, for even the wisest presidents often have occasion to ask advice—from the directors—on evenly balanced questions. This theory of management of a receivership was well set forth by Judge Hanford in the United States District Court at Seattle, Wash., last May. An extract from his decision was printed in the *Railroad Gazette* of June 1. Among other things Judge Hanford says:

"It is impossible for the court to actively manage the details of a railway corporation's business, except through a general agent. A receiver, as such agent, therefore, occupies the position and has the rights of an employer, although the men operating the railway under him are, in a certain sense, employees of the court. It is impracticable for the court to give such attention to matters of detail as would be necessary to justify it in overruling a receiver in the matter here at issue. Only in matters of general policy can the court give directions to a receiver. Grievances of his subordinates will receive attention in all matters affecting the general policy of the business entrusted to him, and whenever they amount to an accusation against the receiver of sufficient gravity to justify his dismissal. The remedy proper in case of an abuse of power in such matters is removal of the receiver from office."

The Industry of Train Robbing.

We chronicle in another column two train robberies notable for the large amounts of money lost. Possibly the figures are exaggerated, but these two incidents are worth more than passing notice, aside from the magnitude of the financial question, for they were both near large cities. Mr. Pinkerton has told us that these daring raids are feasible within 10 miles of New York City, and at this rate, the first we know his words will be proving true.

The moral or warning from these robberies is no different, of course, from that which has been given many times before. As far as the money loss is concerned, the express companies decide for themselves,

and no doubt intelligently, whether to carry treasure only in the day time, or to provide safes that will be burglar proof for 12 hours, or to put on a stronger force of guards, or to let things run on as they are and charge enough to compensate them for their losses. As long as they can get messengers who will risk their lives it is possible for them to look at the matter from this point of view exclusively.

But the question for the railroads and state and municipal officers is more difficult. Passengers are profoundly interested in these affairs, even if the robbers do not go back of the express car. The terrorizing is, for many passengers, worse than the loss of watches and purses. In the Virginia robbery the conductor went through a passenger car, well filled, inquiring for a pistol and found only one.

As we have said before, the railroads ought, or at least they have a good right, to wait on the civil authority. The railroad is not the proper party to take the initiative. In the wilderness as well as in New York City, the way to stop highway robbery is, by constant general repressive measures against the whole criminal class, and by society as a whole—that is, by all police officers throughout a state and not merely in the cities along the railroads. Moreover, society must act to save its own reputation. We call ourselves a highly civilized nation, but there is no civilized nation on the face of the earth in which such train robberies could happen. In England or among the great nations of the continent of Europe they would be inconceivable. We never hear of them in the Australian colonies, where the railroads cross vast areas of thinly peopled country. Even the South American states and Mexico are free from them; and caravan travel across the desert of Africa and Asia is apparently safer from brigands than the "limited" trains of the United States.

Perhaps those who are responsible for repressing crime fail to realize that train robbery is a common resource of criminals. During the past six months we have noted no less than fifteen attempts to rob trains (other than freight trains), and four or five of them were successful. Half of these were south and west of St. Louis, but states farther east are by no means free. As far as this question is concerned, there are places in Georgia and Indiana which may as truly be called wilderness as any in more remote districts. Every one will recall the successful raid on an important passenger train at Kessler, in the last named state, last year. These robbers were never caught and another attempt was reported from the same locality a few weeks ago.

And, as we intimated in noticing this topic last year (page 506, July 7), the duty of keeping the closest possible watch on all vagrants and idle persons known to have vicious tendencies, presses seriously upon state municipal authorities for more than one reason. During the past summer there have been 38 derailments of trains by malicious obstructions placed upon the tracks; a dozen similar cases have been reported in the newspapers where the train was not derailed, though more or less damage was done; and we have press despatches telling of one hundred and four attempts at mischief of this kind. In all probability some of these reports are based on suspicion only; in some cases children or other persons not fully realizing the danger have placed small hard substances, like a bolt, on the rail; now and then some worthless fellow is eccentric enough to put a tie on the rails so as to get a reward for taking it off; but after making full allowance for all these we still have left very many more cases of actual danger through the most devilish malice, than any one can look upon with composure. The disaster at Lincoln, Neb., August 9, where eleven persons were killed, and one at Tomahawk Junction, Wis., October 7, where the timbers of a trestle had been cut nearly in two with a cross-cut saw, are sufficient reminders that these press despatches are not all based on reporters' fancies.

No one railroad manager finds himself called upon to deal with actual violence of this kind very frequently, of course; but the only hope of a relief is for every one to constantly press the officers of the law to do their simple duty by the railroads and their passengers as well as by other citizens.

Pensions and Relief Funds for Railroad Men.

Among all the plans for raising the character of the men in the employ of railroad companies and for securing stability in the working staff and a common interest in the prosperity of the business, the plan of providing for the officers and men in temporary disability and after retirement from the service has long seemed to us one of the most useful. The social economies of the plan are complicated. Perhaps it would be better for the railroad company to stick closely to its proper

business of making and selling transportation, and leave each man free to buy his insurance and his annuity where he pleases and of companies organized to carry on these special businesses. We are inclined to think that under ideal conditions this would be true. But we are not dealing with ideal conditions. A very large percentage of the actual men are improvident or ignorant or both; will spend all they earn, and will not carry accident or life insurance or annuities. Moreover, it is often difficult and usually costly for them to do so. It seems probable that the railroad company that will spend liberally but judiciously to help the men to provide for a rainy day will find the money so spent well invested. The idea is not a new one; in Europe, in India, and generally outside of the United States, pension and relief funds are rather the rule than the exception.

In Great Britain the railroad companies long ago accepted the principle of establishing funds of various sorts for the benefit of employees. Mr. Seargeant, General Manager of the Grand Trunk Railway, in a paper read before the Railroad Congress at Chicago last year said that the "object which English railroad companies have had in view in the establishment of superannuation fund associations has been to provide for members after their active employment has ceased, to secure permanence of service, to relieve the individual from the anxieties dependent upon the prospect of being unable to provide for himself and family, and in short to attach permanently to the service better men and to secure from them the better performance of their duties." We can hardly doubt that these results must have been attained, and obviously there is a greater feeling of stability in the service and a higher sense of loyalty to the company among English railroad employees than among our own. The stockholders of the English railroads and the Government have recognized and authorized the formation of these funds. In 1873 an act was passed establishing a superannuation fund association in the Railway Clearing House for the benefit of salaried officers and clerks of any railroad company belonging to the clearing system, and of the officers and clerks of the joint committees, which with the Clearing House administer a great many of those affairs which affect the railroads in common.

But the individual railroad companies began the foundation of benefit funds long before the Clearing House fund was established. For instance, on the Great Eastern, a provident society was established in 1851. The object of this society is to provide a fund for the mutual relief of members in sickness, a pension in case of old age, accident or total incapacity to earn a livelihood, and allowance in case of death of a member and for the funeral expenses of the wife of a member. All male persons in the service of the company not less than 16 nor more than 35 years of age may join the association. This is quite different from the ordinary English practice by which membership in the various funds is usually limited to a somewhat restricted class. The Great Eastern Provident Society is managed by a committee of twelve resident members, who are elected at general meetings, a portion of them retiring each year. The president, vice-president and trustees of the society are the superior officers of the railroad company itself, the president of the society being ordinarily but not necessarily, the Chairman of the Board of Directors of the railroad company. The managing committee holds monthly meetings, the members of the committee being allowed traveling expenses and being fined when they do not attend. The highest weekly premium paid is 10 pence; the maximum weekly allowance is 16 shillings, with free medical attendance and medicines; the maximum pension is 6 shillings and 10 pence a week.

On the Great Eastern there is also an accident fund which was established in 1878. This applies to officers and "servants" of the company, and provides for a weekly allowance and also for life insurance. To this fund the company contributes an amount equal to one-half of the amount paid in by the insurers, and a further sum of £30 on the death from accident of any insurer. This fund is managed by the Board of Directors, the Secretary, General Manager and Solicitor of the railroad company. The insurers pay two pence weekly, the weekly premiums being deducted from the wages. Membership in this fund is not compulsory and it ceases in event of the insurer leaving or being dismissed from the service of the company.

On the same railroad there is a pension fund which applies only to employees working for weekly wages and does not include members of the salaried staff. To this fund also this company contributes a sum equal to the aggregate contributions of the members. This was established in 1890. It is not compulsory

upon any employee working for weekly wages to become a member of the pension fund. Any employee whose age does not exceed 25 is eligible to membership, and in fact, at the establishment of the fund, employees up to 55 years old could become members if they applied within six months of the establishment. The introduction of such a large number of old members made the scale of payment somewhat complicated, but for those entering in the ordinary way the maximum payment is 5 pence a week, which gives a pension of £25 per annum at 65 years of age. After 30 years' contribution, retiring allowances on failure of health before 65 are also provided for.

A superannuation fund was established in 1878 providing pensions for salaried officers only; that is, everybody above the weekly wages rank or above the grades of clerk and inspector. Membership in this fund is obligatory on all members under 25 years of age when they enter the service. Members pay 2½ per cent. of their salaries and the company adds a like amount. The annuity paid is a certain percentage of the average salary of the contributor.

There is still another fund called the supplemental old age relief fund, which was established in the beginning of 1892. This is for the benefit of members of the wages staff between 55 and 65 years old. Any employee joining this fund may pay in any amount not exceeding £100, and may pay in easy instalments, compound interest at the rate of 4 per cent. being allowed. This fund provides small weekly pensions for the old fellows who go into it. In the year 1893 the Great Eastern contributed to these various funds about \$135,000.

The London & Northwestern has several funds of a similar character. Its superannuation fund for the benefit of salaried officers and clerks, was established in 1853. In this the weekly payment is 2½ per cent. of the salary, and the company contributes an equal amount. The membership in this fund at the time Sir George Findlay wrote his excellent little book on *The Working and Management of an English Railway*, that is, in 1889, had reached almost 6,000.

The London & Northwestern Insurance Society was established in 1871 to provide for all members of the wages staff except those in the locomotive department. Membership in this society is compulsory, and the company undertakes to contribute a sum equal to five-sixths of the premiums paid by the employees. This provides for a lump allowance in case of permanent disability, from accident, a weekly allowance for temporary disability and for insurance in case of death. This society is administered by a committee of fifteen, twelve of whom are elected at a general meeting of the membership and three are appointed by the directors of the company. At the end of 1889 the membership in this society amounted to 43,528. In 1874 the Provident and Pension Society was formed to provide weekly allowance in case of ordinary sickness for the members of the wages staff other than those employed in the locomotive department. This gives weekly allowance in case of ordinary sickness, a retiring allowance in case of permanent disability, and a sum payable at death in all cases provided for by the rules of the Insurance Society. It also provides for medical attendance and for funeral expenses on the death of a member's wife. Membership in this society is compulsory and the company contributes £800 per annum, and further credits to the fund of this society the fines inflicted upon employees. At the end of 1889 the membership in this society was 23,500.

A pension fund was established in 1883 to provide a retiring pension for members after reaching the age of 65, or for those who, having reached the age of 60, are obliged to quit work. In this fund first-class members pay 2 pence a week and get 10 shillings a week on retirement. Second-class members pay one penny a week and get a pension of 7 shillings a week. These two societies, the provident and pension society and the pension fund, have now been amalgamated.

In 1881 there was established what is known as the Works Mutual Insurance Society for the benefit of employees of the engine and general manufacturing works of the company, and still another society including the running department alone; that is, engine-men, firemen, assistant firemen and round-house men of various classes are eligible. These latter societies are managed by delegates elected by the members, and representatives of the company appointed by directors. They provide pensions, also weekly allowances. The expenses are met by calls upon the members from time to time, the company also contributing. At the end of 1889 the membership in these two societies was over 15,000.

Our information concerning the establishments of

the Great Eastern and the London & Northwestern, is drawn from original documents and from Sir George Findlay's book. Mr. Seargeant's address, before alluded to, makes brief mention of the arrangements of the various other English railroads. The Great Western, for instance, has a fund for officers and a fund for the wages staff, the company contributing in each case an amount equal to the sum paid by the members. The Great Northern has an association covering officers and servants of all grades. The London, Brighton & South Coast has a fund providing for officers and for most employees down to the grade of guard and porter, but we discover no provision for these important classes or for the trackmen and various other employees of grades below engine driver. Towards this fund the members contribute 2½ per cent. of their salaries and the company an equal amount. We judge from Mr. Seargeant's paper that none of the other English railroad companies than those mentioned have organizations for the benefit of the wages staff, although a good many others have funds applicable to salaried officers only.

The oldest arrangement of this kind that we know of on this continent is the Superannuation and Provident Fund Association of the Grand Trunk Railway, which was established Oct. 1, 1874. Employees over 37 years of age are not eligible for membership; those receiving less than \$400 a year need not join unless they wish to, but every salaried officer, clerk, agent, operator, roadmaster, mechanical foreman or inspector in any department must become a member. Each member must contribute 2½ per cent. of his salary and the company pays in the same amount. At the age of 55 any member may retire, irrespective of health or other condition, and he will receive an annual allowance equal to one-sixtieth of his salary at the time of his retirement, multiplied by the number of years which he has contributed to the fund, provided that this annuity does not exceed two-thirds of his average salary. If a member dies before superannuation his payments are refunded. If a member is dismissed from the service for any cause but misconduct or dishonesty, he will receive back half of his contributions. Up to the end of December, 1893, the total receipts of this fund amounted to \$405,896, but apparently superannuation payments had not begun.

In the United States there are a number of railroad companies which have established relief societies, some of which have reached considerable importance. The oldest of these is that of the Baltimore & Ohio Railroad, which was established in 1880, principally through the energy and foresight of Doctor Barnard. The charter of this association was repealed in 1888 and it was then reorganized. Before the reorganization about \$1,800,000 had been paid for benefits to employees and their families.

The most important existing organization of this character in the United States is that of the Pennsylvania Railroad Company and the Pennsylvania Lines West of Pittsburg. The Philadelphia & Reading has also a similar organization, as have the Chicago, Burlington & Quincy, the Northern Pacific, and the Lehigh Valley. A paper by Mr. R. F. Smith, Superintendent of the Relief Department of the Pennsylvania Lines west of Pittsburg, read before the World's Fair Railroad Congress, gives some particulars as to the nature and purposes of the organizations on the Pennsylvania, which are practically the same as those of the other railroads.

Membership is voluntary except in the case of one road, which makes it compulsory. The fund is disbursed for benefits to employees in case of accident or sickness and to their beneficiaries in case of death. The fund is formed chiefly by contributions from employees, collected monthly on the pay roll; but the company pays the running expenses, which are heavy, as they include the payment to surgeons and hospital expenses as well as the cost of administration. The railroad company also pays allowances to men whose disabilities continue beyond the time allowed by the organization. We find from the annual report of the Pennsylvania Railroad Company, for the year 1893, that in that year, on the lines east of Pittsburg, the receipts from the members were \$603,531, and the total payments by the railroad company were \$120,353. The sums paid out in various benefits were \$642,395, and the number of members was 32,872. On this railroad there is also a saving-fund administered not connected with the relief department, and this has 4,058 members and deposits of \$1,262,039. Mr. Smith informs us that the relief fund of the Pennsylvania Lines West paid benefits during the first 3½ years of its existence amounting to \$705,811, and the companies paid in those years for relief, beyond the time limit of benefit allowance, \$8,319. On the Pennsylvania Railroad from the establishment of the department in 1886 to the end of its seventh year benefits

had been paid out aggregating \$2,528,428 and the company had paid besides that \$79,241 for cases of sickness continued beyond the limit of allowance from the relief fund. The total benefits paid up to December 31, 1892, of the whole Pennsylvania system, covering 7 years east of Pittsburgh and 3½ west, amounted to \$3,377,798, and the expenses paid wholly by the companies were \$677,198. It will be seen that the aggregate benefit to members has amounted to a very large sum and that the expense to the railroad company itself has been considerable.

Some Unsolved Problems of Elevated Railroads in Chicago.

In some articles which we published last May and June on the great "rapid transit" railroads of New York and London we tried to express some idea of the complicated nature of the problems arising in building rapid transit railroads in cities. Those who are interested will find in Chicago several examples that will illustrate what we have said about the probable financial success of rapid transit schemes. We have said that the only really profitable great city railroads (leaving out street railroads proper) are those in New York, where the physical conditions force the traffic into the long parallel lines on which the elevated roads have been built. The success of the Manhattan road led speculators to believe they could float the bonds and stock of elevated and rapid transit lines in other cities, and for several reasons, Chicago, with its promise of rapid development, has been for some years a favorite field for projects of this kind. Long before the first elevated was built in Chicago there were many schemes advanced having primarily the object of placing the stock with an unsuspecting public. There were bicycle, pneumatic and other monstrosities in type offered as an additional attraction by which it was claimed passengers could be carried for less money than with the Manhattan type of equipment and structure. Over ten years ago it was even seriously proposed to build an underground road in Chicago, and estimates and plans were made, but the money was not forthcoming. About five years ago the first serious attempt was made to build a paying road, and this project was carried forward to final completion and is now known as the "Alley" road. The correct name of the road is the Chicago & South Side Rapid Transit Railroad Company. It is called the "Alley" road because a considerable portion is built along one side of an alley which runs north and south between Wabash avenue and State street. The road turns east at 39th street and crosses over to another alley and continues south to 63rd street, where it turns east to Jackson Park. It is necessary to understand the location of this road in order to comprehend the amount of traffic which may be expected over it and the competition which it has to meet.

The original plan of this road was laid out to avoid damage suits and to give real rapid transit; therefore the right of way was mostly purchased outright, and the equipment was selected to give safe travel with the high average speed of 15 miles an hour between terminals with 2½ stations per mile, or an average of about 1,900 feet between stations. The road was started with Eastern capital, but finally it became necessary to get further financial assistance, and this was found in Chicago, the capital being furnished by interests so closely allied to the cable roads which parallel the "Alley" that it became evident to all insiders at that time that nothing would be done to develop the "Alley" to make it a serious competitor for the cable roads. It has often been said that this was a piece of good financing which removed the threatened competition of the cable systems.

So long as the management of the road was vested in the Eastern interests the road was run for traffic, and commodious trains and high average speed were provided, but later this was changed, until finally, after the close of the World's Fair, the speed was reduced and the trains decreased until there was a six-minute interval, and there was no real advantage in the point of speed between traveling on the elevated and on the cable. That is, from most points the time required to walk up to the elevated platform and down again and wait for trains and travel to Congress street, where the road terminates, was as much as to travel to the same point on the cable roads, and traffic, fell off. The original plan was to provide express trains, and the necessary sidings were allowed for, but this was not carried out and the Illinois Central started an express train service from the terminal of the elevated and practically took the through traffic. The road then had to compete with the cable for local traffic and offering no important advantages it failed to get the business to which it was naturally entitled. There was an opportunity, it is generally understood, for

this road to have a down-town loop, but for various reasons, obvious or obscure, it was not built, and the road is in the position of having neglected opportunities to an extent that has practically robbed it of the through traffic and put it in a position where it cannot compete as it should with the cables for local traffic, as its down-town terminus is a long way from the principal shopping district, to which district the competing cable lines all run.

So far south as 39th street the "Alley" road is paralleled on one side by the State street cable within a half a block, and by the Wabash avenue cable within a half a block to 22nd street, and then the cable and elevated diverge, the cable passing through the most thickly settled southern portion, which is also tapped by the Illinois Central local trains. The Wabash cable and the elevated come together again at the crossing of Cottage Grove avenue and 63rd street. In this way the "Alley" road has a strong competitor at nearly every important point of its line, and where there is no competition the district is not thickly settled. An important fact in all this is that the cost of carrying a passenger is greater on the elevated than on the cable lines, and the fare being the same the profit is less, and so long as there is no more traffic than the cable roads can carry there is a reason why the cable companies might wish to have the inducements to passengers to travel on the elevated reduced, and thus divert the traffic to the cables, the same people being large owners in both.

Meantime, since the "Alley" was completed, another elevated, the Lake street, has been put in operation on the West Side. This road started under a cloud as to its charter and with little ready money. Its projectors took the risk of damage suits and built the road in the middle of the street and therefore at a less cost for actual construction per mile than the "Alley" road. This road, like the "Alley," parallels cable lines, the Yerkes systems, and now the road has fallen, as might have been expected, under the control of the Yerkes interests and it has been so altered in its scope by the change in control that it promises not to interfere seriously with the operation of the Yerkes cable lines, but rather to strengthen those lines and perhaps obviate the necessity for the further extension of the cables. A further matter is that the Yerkes interests control the franchise for building what is called the Northwestern Elevated, which has been laid out to tap a new section of the northern district and operate in a place where a cable or electric road would have to be built eventually to provide proper transportation. The attaining of the control of these roads was compulsory to the Yerkes interests, otherwise they would be operated in competition.

An important fact is that the Yerkes interests have, so far as can be seen, obtained the only valuable franchise for a down-town loop; this loop is being pushed and it looks now as if the Yerkes interests would finally be in position to dictate terms to the other elevated road in the matter of a down-town terminal and it is probably this knowledge, possessed by brokers, that has kept the stock of the Lake street from dropping to the point which the Alley reached at one time. Certainly the earnings of the Lake street have not held up its stock.

A little farther south, on the West Side, there has been built an elevated road which it is expected will be in operation by January 1st. This road, the Metropolitan, is to be worked by electricity. The other roads have steam locomotives. The Northwestern has not been started in construction, but it is laid out to be operated by electricity. The Metropolitan parallels the Yerkes cables, and although it passes for a considerable portion of its length through the most thickly settled portion of the city, where the working population live, yet it, like the Alley, has a down-town terminus remote from the district where a majority of the working people go. Further, its Northwestern franchise parallels Milwaukee avenue, which is a long street, through the most thickly settled portion and on which the Yerkes cable operates. Likewise the Lake Street Elevated has a franchise along this avenue and there is something of a rush on the part of both roads to see which will get there first.

This, then, is about the status of the Chicago elevated problems at present, and it is no wonder that the stockholders in these roads are getting uneasy, as they do not know the full intent of the managers, nor what the real policies of the roads are. All that they know is what is apparent to every one, namely, that the transportation facilities in Chicago promise to exceed the demand so far as capacity is concerned. Probably the demand for speed will always be ahead of the velocity of the trains in that rushing city.

Very lately it has been reported that the officers in charge of the construction of the Metropolitan threaten to parallel all of the Yerkes lines and

kill them by competition, but of course no one believes that this will be done, and there will probably be a consolidation of interests or a compromise, but it remains to be seen which will come out ahead, the Yerkes acknowledged power in money and control of local conditions, or the vast fortunes back of the Metropolitan. The Alley is apparently not in this fight, but is waiting and watching, and the minority interests are hoping for something in the way of a loop to turn up for its advantage. Another month will settle some of these questions, and probably before the first of the year a loop will be under way, and it is hoped, for the good of all concerned, that the construction will be undertaken by an independent company, or by a joint interest, so that the tribute for running trains may not be exorbitant and result in hardship on those lines which, having had an opportunity to build the loop, neglected it, and now find they made a mistake in doing so.

The hopes of some of the stockholders of the Alley and the Lake street roads, which are operated by steam locomotives, have been raised by the proposition to change to electric motive power, and they have been led to believe that such a change would reduce the cost of operation so as to permit a profit with the present capacity and traffic, but those who know the fundamental facts about the cost of operating elevated roads, know that the cost for fuel is not the most important item on small elevated roads, and before such roads can get a substantial profit from fuel savings it must have a large traffic to pay the fixed charges and wages. It is true that no more coal would be required to run the road with electricity than with steam, and that the soft coal for the electric system costs but \$2 a ton or less, while hard coal for the steam locomotive costs \$6 a ton or more; but the total amount thus saved is not great unless there is a large traffic, yet the fixed charges are nearly the same for heavy as for light traffic, and the labor, salaries and wages are not so much dependent upon the amount of the traffic as upon the number of the trains and the service. That is, the operating force is about the same for well loaded trains as for empty trains, while the fuel required increases with the traffic. Hence, to make a profit from a saving in the cost of fuel, there must first be sufficient traffic to nearly if not quite cover the fixed charges and the costs of operation, other than the fuel cost.

No doubt the total operating expense will be considerably decreased by changing to electric power, and probably no more elevated roads will be built for steam locomotives, yet to change from steam to electricity requires a large outlay and in this way the fixed charges are increased, so that the saving in cost of fuel is not to be taken as clear gain and the mere alteration from one kind of motive power to the other will not generally make an elevated railroad profitable, unless it can maintain itself and meet all expenses before the change.

There is one thing about the attitude of the riding public towards elevated roads, after they are built and the newness has worn off, that is not fully appreciated by promoters. It is that people will not ride unless it is to their advantage to do so, and it is not to their advantage to climb up and down stairways and jostle with the crowd, unless they get two things by so doing, viz.: a saving in time and greater comfort. In the matter of comfort there used to be better light for reading in the elevated trains, but now Pintsch gas or electric lights are used in the street cars. In Chicago there used to be not even standing room in the street cars, only a place to hang on by one arm around a post and a space for one Chicago foot on the side boards; but this has changed, and in the four-car cable trains, lighted by Pintsch gas, one can always get comfortable standing room and often a seat. In the face of this the Alley road reduced the number of cars per train and compelled many passengers to stand during the hours of heavy traffic, with the results that we all know about. It is necessary, then, for elevated roads to give a seat and plenty of light to keep pace with the street car lines. The street cars being now about as well heated and ventilated as the elevated cars, there appears to be no further inducement in comfort that the elevated lines can offer that will have much effect on the traffic, especially in a city like Chicago where the population has a large foreign element, to whose happiness modern comforts are not vital and who do not miss the niceties of living having never known them. In fact, judging from the report of the Sweat Shop and Health Commissioners, one might suppose that their evolution had taken place in such environment that bad air and semi-darkness are essential to their well-being.

But, however this may be, the fact is that elevated lines can no longer rely on mere increase of bodily comfort to get passengers out of a territory in Chi-

cago that is already tapped by cable and electric lines and there only remain for them two things to do, namely, to save time and carry the passengers close to the points where they want to go. A saving of time means more than quick speed, although that is a first essential. It means that there must be a short interval between trains, so that there need be no waiting on cold and bleak platforms. The short interval makes an expensive service, particularly when steam locomotives are used. Electric traction promises to help in this matter and to permit more frequent trains with less expense, for reasons which we have not space to outline here.

Now comes the important point, which is that quick transit does not mean high maximum speed but high average speed, and this cannot be had with many stations per mile. It is practically true that what is called rapid transit cannot be provided when there are more than four stations per mile, and this is to be compared with the service offered by the street car lines with 10 stations per mile or one every block. In this way, passengers on rapid transit lines will always have to walk farther than those on street lines, and there must be a considerable decrease in the time required for a passenger to reach his destination to make up for the greater walking distance and the climbing up and down stairs.

The cable trains, in a city like Chicago, are run, not on the theoretical plan of stopping for all passengers, but upon what they find to be a more practical plan in that city, that of slowing down when signaled or when passengers are seen waiting and tempting the people to jump on while the trains are in motion. This seems to suit the Chicago public, and the street cars only stop, therefore, when, in the judgment of the gripman or conductor, there will be a "howl" if they do not stop. It is not uncommon to see both men and women getting on and off the cable cars while in motion, and the old saying among conductors that a woman always gets off backwards is no longer true in that city; in fact, one can see tailor-made gowns swinging on and off moving trains in a way that strikes terror to visitors. This method of running has increased the average speeds so that eight miles an hour between terminals is made on some lines, while the fastest elevated now makes an average of twelve.

Omitting for the moment the loss of time traveling to the elevated stations and in climbing up and down stairways, let us see what is the saving in time for the short distances traveled in Chicago. For two miles the saving is five minutes, for four miles ten minutes, and for five miles twelve and a half minutes. Even with frequent trains there is little or no inducement to passengers, without counting the handicap of longer walking distance and climbing stairs, under three miles. And with stations $2\frac{1}{2}$ per mile and trains at five minute intervals, there is no great inducement up to five miles. Hence it is clear that to get passengers in Chicago away from the cable lines the elevated roads must provide a convenient down-town terminus, plenty of seats, good light and ventilation, and give an average speed of nearly fifteen miles an hour. Even then there will not be any strong inducement to ride for distances less than three miles where the cable lines are paralleled. Three miles from the centre of Chicago limits the thickly settled resident district, and five miles on the average is the limit where the population can be counted upon to pay dividends.

The Metropolitan road has appreciated the need for express service which these practical facts indicate and has given a four-track road to the down-town section, and if it has a loop terminal it will be in position to compete, and practically to gain the majority of the traffic beyond the three-mile limit. It has been claimed by projectors of elevated lines in Chicago that the city area lies along the lake for 25 miles, and is adapted, therefore, for long lines of elevated road, but curiously enough none of the roads that have been built can be said to run along that portion of the city except the Alley, and that road has permitted the Illinois Central to take its through business and between terminals has to compete with two cable lines which give quick service and an enormous number of trains per day.

These are some of the conditions of traffic in Chicago which the elevated roads are trying to meet, and it will be interesting to see how they will do it. It is common to hear the proposition to run street cars on the elevated structures, using electric power and two car trains, and it is claimed that in this way there could be formed a competing street car line, but it is evident that such a plan would be a failure when the long distances between stations and other matters are considered. To increase the number of stations would greatly increase the expense and decrease the speed, so the only thing for the roads to do is to stick to real rapid transit and make the lines attractive by reducing the time between the shop, the office and the dwelling.

Locomotive Lubrication.

We have said recently, in noting some of the improvements in locomotive construction, that the present tendency is to so construct all parts of the locomotive that no adjustment of them by the enginemen while on the road will be possible. The more general use of solid end rods and the driving box adjustment now used on the Pennsylvania and the Chicago, Burlington & Quincy, were noted as examples of the present tendency.

The determination to fix the length of rods and the adjustment of driving boxes, so that they could be changed only in the shop, was not as bold as the determination to fix the rate of supply of oil to the crank pins and other important parts. It was formerly considered best to have an adjustable oil cup on the rods so that the engineman could regulate the rate of feed, and he was expected to change the feed to correspond with any decided change in the temperature or unusual friction, and to close all feeds during a stop of longer duration than the average station stop. A few of the brighter and more progressive engineers adjusted the cups about to the requirements necessary to prevent wear and heating, but the great majority, having no idea of the amount required, made a practice of adjusting the cups so that not quite all the oil would be used between points at which the cups could be refilled. As a result, the ties and road-bed were kept well soaked with oil. The error of this was recognized, and the mechanical departments of many of the roads took upon themselves the responsibility of regulating the amount of oil used in all kinds of weather and service, and devised a rod cup that could not be changed by the enginemen. The cup has generally taken the form of the "needle feed," in which the "needle" or spindle is thrown up and down, alternately opening the feed hole, with the vibration of the rod.

Such cups give good satisfaction for such parts as have sufficient vertical motion to throw the needle, as the side rods and the back end of the main rod. A slight change might also make them suited to the cross-head end of the main rod, although some think that a sponge cup or a cup with a screw feed is best suited for this location.

A very suitable cup for eccentrics is made by using a brass bowl and wrought iron spud similar to rod cups, the difference between the cups being that the cover of the eccentric cup has an open funnel projecting above it; the bowl of the cup is filled with waste, and the oil runs down through it from the funnel. The waste can be renewed at intervals to prevent grit getting to the wearing surfaces. This cup may be classed as an adjustable one, because the harder the waste is packed into the cup, the slower will the oil pass through it from above the waste to the surfaces to be lubricated.

A screw-feed cup is found very satisfactory for use on the guides; it is best to have the brass top secured to the cup or to the guide by means of a short chain. The cup should be made with a wrought iron spud, the same as the rod cups. Another means of lubricating the bearing surfaces of guides and cross-head is to use a wipe much similar to that used in stationary engine practice to lubricate the cross-head pin.

So far as we know, no well-devised scheme for regulating the supply of oil to the main bearings of a locomotive has had sufficient trial to determine its merits. A number of devices have appeared, perhaps one of the best being a large supply cup provided with as many little force pumps as there are bearings to be lubricated. The pumps are operated simultaneously from an attachment on one axle, and may be regulated so as to force a small supply of oil to each bearing once during a determined number of revolutions of the axle. A small pipe, similar to a cylinder lubricator pipe, connects the cup with each bearing. Such a cup need not be much larger than the cylinder lubricator. The advantage of such a device is that the oil can be applied directly to the point requiring it, and under pressure if desired; thus it is necessary to supply only so much oil as is needed for lubrication; the disadvantage would be the trouble with clogged pipes.

While on this subject, we might mention the lubrication of locomotive cylinders. It is expected that the enginemen will regulate the rate of supply of oil to the valves and cylinders, and cut off all supply when the engine is stopped for any length of time. How well such regulating is done is well known by those who are familiar with the ways of enginemen. Only very few will regulate the supply to what it ought to be, from two to four drops a minute to each valve; the majority allowing the oil to escape at the rate of from 25 to 40 drops a minute. It was found best to take from the engineman the trouble of regulating the rate of feed of the rod cups. It will also be found advantageous to so construct the cylinder lubricator that it will have two rates of feed, either no oil or from two to four drops a minute for each valve.

The German Railroad Union.

The statistical report of the German Railroad Union for the year 1892 shows that the aggregate length of the railroads in the Union at the close of the year was 45,880 miles, of which 26,235 miles were in Germany, 16,089 in Austria-Hungary, and the remainder in Belgium, Holland, etc. There was an increase of 561 miles during the year. Of the whole mileage 11,453 miles (23 per cent.) was double-track road, and 50 miles had three or four tracks. Of the lines in Germany just about one-third was double-track; of those in Austria-Hungary, only 12

per cent. The length of sidings, etc., was 17,350 miles, and the aggregate length of all tracks in the Union was 75,361 miles. Of this 612 miles was of double-headed rails in chairs on wooden ties, 61,900 miles T rails on wooden ties, 3,647 miles on iron longitudinal sleepers, 8,920 miles on iron cross-ties, 147 miles on other iron supports, and 254 miles on stone blocks. There were thus 12,714 miles of track on iron sleepers, which is much more than in all the rest of the world, doubtless. The track on iron longitudinal sleepers decreased 120 miles ($3\frac{1}{4}$ per cent.) during the year; that on iron cross-ties increased 636 miles (8 per cent.), and that on wooden cross-ties increased 1,110 miles ($1\frac{1}{4}$ per cent.). These railroads are the only ones which have had long experience with iron sleepers on a large scale, and the results deserve attention. A considerable mileage has been laid 20 years or so, and thousands of miles 10 or 15 years. Relatively, it is seen, the structure with iron cross-ties grows fastest; but the change from wood to iron is very slow, indicating that the advantage of iron is not generally recognized, or at least not so great as to lead to a general renewal of wood with iron.

Iron rails still form 22 $\frac{3}{4}$ per cent. of the German tracks, and the decrease of iron tracks was only 1,304 miles during the year, when we may presume that no new iron was laid.

There were 12,858 stations on the Union railroads, which is at the rate of one for every 3.55 miles of road. The stock of locomotives was 22,629, or at the rate of 0.48 per mile of road. Their average service in hauling trains was 14,806 miles each, which does not include over 33,000,000 hours of switching and other service.

The train movement of the year was at the rate of 4.84 passenger and 4.39 freight and mixed trains each way daily over the whole mileage. The traffic was at the rate of 328 passengers and 583 tons of freight each way daily. Of the passenger travel, 2.4 per cent. was first-class, 16.6 second-class, 57.0 per cent. third-class, 18.7 per cent. fourth-class, and 5.3 military. Only the North German railroads have the fourth-class.

The average receipt per passenger mile on all the roads was 1.12 cents, against 1.15 cents in 1891. The reduction was chiefly on the Austrian and Hungarian lines, due to new tariffs. The average of German roads was 1.16 cents; on the Austrian and Hungarian, 0.938 cents, on the other Union railroads, 1.318. It must be remembered that the different proportions of the different classes has a great effect upon the average rate. The averages for the different classes in the different groups per passenger per mile were in cents.

	1.	2.	3.	4.	Military.
Germany.....	3.018	1.930	1.147	0.757	0.687
Austria-Hungary.....	2.173	1.448	0.791	0.722	0.525
Other.....	2.414	1.913	1.143	0.830	0.749

The average receipt per ton per mile was 1.34 cents, and varied comparatively little with different groups, being exactly that in Germany, a trifle more in Austria-Hungary, and a little less on the other roads.

The gross earnings were at the rate of \$1.40 per train-mile; the working expenses were 59 $\frac{1}{2}$ per cent of this, or 83.3 cents, leaving 56.7 net per train-mile. Net earnings per mile of road were \$4,050, and 4.68 per cent. on the cost of the roads.

The force employed by the Union railroads amounted to 654,705 men, or 14 $\frac{1}{4}$ per mile of road. Of these 271,684 were regularly appointed permanent employees, and the other 383,021 were day laborers. The pay of these men averaged \$267 per year, which may be compared with the \$185 of the Sicilian railroad employees.

Annual Reports.

Chicago & Eastern Illinois.—This company reports for the year ending June 30, 1894. The miles operated were 516, and in each of the two preceding years 480. The principal results of operation are shown in the table below:

	1894.	1893.	Inc. or Dec. p. c.
Freight.....	\$2,063,734	\$3,417,503	D 22.06
Passenger.....	1,069,133	872,891	I 22.48
Mail, express, etc....	127,248	156,565	D 12.34
Total gross.....	\$3,860,114	\$4,446,959	D 13.20
Oper. expenses.....	2,250,299	2,795,995	D 19.52
Taxes.....	159,411	194,319	D 17.96
Net earnings.....	\$1,609,816	\$1,650,963	D 2.49
Per cent. oper. exp.	58.30	62.88	

The tons of freight carried decreased 26.85 per cent. to 3,223,579 tons. The ton-miles decreased 27.58 per cent., having been in the last year 420,484,239. The average haul was 130.4 miles as against 131.7, and the ton-mile rate was 0.63 cents against 0.59 the preceding year. We suppose that the increase in average rate was from the loss in coal tonnage in May and June during the great coal strike, when the earnings were \$24,000 less than in the year before. The only gain shown in the year's operations is in passenger earnings, which it will be observed increased 22.48 per cent. The passengers carried increased 3.41 per cent. and the passenger-miles 29.35, having been last year 70,039,978. The average journey was 16.4 miles as against 13.1 the year before; and the average rate per passenger-mile was 1.53 cents compared with 1.61 the year before. Of course the increase in the length of journey and in the passenger-miles was largely due to the long distance World's Fair travel; but this element does not seem to have been enough to overcome the effect of the low excursion rates, for the rate per mile fell off considerably. At all times the company does enough Chicago suburban business to keep the passenger journey,

the passenger rate and the revenue per passenger low.

During the year the company put in operation the branch from Rossville to Sidell, 34.29 miles long, and completed 73.14 miles of second track at a cost for second track of \$11,700 a mile, for which bonds have been issued at the rate of \$8,000 a mile; the balance has been charged to operating expenses. The company also laid over a thousand tons of new 65-lb. rail and replaced 2,178 ft. of wooden trestle with masonry and iron structures or with earth bank. It also replaced six combination spans over the Wabash River at Attica with a new steel structure. In general, the physical condition of the property has been improved considerably during the year and the large World's Fair traffic was carried without injury to a passenger.

The Chairman of the Board, Mr. H. H. Porter, has a couple of pungent paragraphs on the strikes of the year, which he says have brought chaos in the whole business of the country, misery to wage workers and their families, loss to capital and paralysis to enterprise without gain to any section or individual. He is not at all certain that the recent hardships have left with the wage workers an experience by which they will profit in the future.

New York, New Haven & Hartford.—The annual report of this company for the year ending June 30, 1894, covers 1,447 miles, including the Old Colony and its leased lines. This latter system was not included in the report for 1893, therefore a comparison of figures for the two years is somewhat difficult. The earnings for 1894 are as below:

Passengers	\$14,858,329
Freight	10,423,546
Rents	295,010
Total Gross	\$25,576,885
Operating expenses (70.11 per cent.)	17,932,709
Net from Operation	\$7,644,175
Income from other Sources	109,481
Total Income	\$7,753,656

The balance of the income applicable to dividends was \$2,373,678, and the dividends paid (being 10 per cent.) amounted to \$3,631,292, the deficit having been taken from the previous year's surplus. The loss in gross earnings, as compared with the year before, was nearly 8 per cent., which is attributed entirely to the general depression in business. The income from other sources than operation declined because of reduced dividends from companies whose stock is owned. This item fell off \$198,243.

The work of four-tracking advances and it will probably be finished through Greenwich and through South Norwalk during the present fiscal year. About a million dollars was spent in a new line from a point in East Haven to a junction of the Hartford and Air Line Divisions in New Haven bettering the grade and alignment and getting rid of 10 grade crossings.

The President pays his respects, as last year, to the electric railroads built in the territory contiguous to his railroad and justly criticises the public policy which permits the creation of grade crossings by these roads.

The Peoria, Decatur & Evansville has just begun running sleeping and reclining-chair cars on its through night trains, and they are to be operated by the company directly, the cars having been bought outright from the Pullman Company, at whose shops they have just been built. The announcement to connecting lines states that to popularize the cars the berth and seat rates will be less than those usually charged by sleeping-car companies, though the service will be first-class. This is not a rich road, but its managers seem to understand well how to make the best use of their resources. The line, from Peoria southeastward to Evansville, 248 miles, is not long enough to use up the whole of a night and the business is not heavy enough to warrant a night train for through travel; so the sleepers are run on trains leaving either terminus early in the evening and each makes a long stop at Mattoon, about midway between the termini, thus making an evening train out of each terminus and a morning train into the other, as shown in the following table:

	No. 3. South-bound.	No. 4. North-bound.
Peoria	6:40 p. m.	10:05 a. m.
Mattoon	12:05 a. m.	4:55 a. m.
Mattoon	4:00 a. m.	11:30 p. m.
Evansville	9:30 a. m.	6:00 p. m.

Each of the new cars has four sections containing eight sleeping berths, twelve reclining chairs, a smoking room and a buffet.

At a conference between representatives of Western and Eastern roads held in New York City last week to consider the question of mileage on private cars, a compromise was reached whereby the committee agreed to recommend a uniform rate of 6 mills a mile on tank, stock, refrigerator and other freight cars of private ownership, to become effective as soon as all existing contracts calling for a greater sum per mile have expired. Efforts will now be made by the Western roads to induce the Chicago, Great Western to recede from its position and join the compromise movement. If this can be done the Western lines will advance from 5 mills to 6 mills a mile. The only formidable opponent is the Standard Oil Company, and it is thought that corporation will accept a rate of 6 mills rather than provoke a contest.

The Travelers' Protective Association of America, through its "National Railroad Committee," has made a big bluff at the Western roads by authorizing a boycott on all the roads except the Chicago, Milwaukee & St. Paul and the Wisconsin Central because of their refusal to authorize a 5,000-mile interchangeable mileage ticket as demanded by the association. The gentlemen of this enterprising organization are likely to find that they have not materially improved their chances of securing the desired concession by the course they are taking. Boycotts are not popular, and, besides, the two roads exempted do not reach all points in the West, and traveling by wagon will not be pleasant during the winter season, nor profitable.

The Trunk Line and Central Traffic Board of Arbitration has decided that the \$1.25 excess fare heretofore charged on the train leaving Chicago at 10.30 a. m., over the Lake Shore for New York may be abolished, and the Michigan Central will do the same on the train over that road which runs at the same speed. The only excess fares charged for fast time on these lines now, are the following:

N. Y. C., leave New York 1 p. m., 26 hours . . .	\$2
N. Y. C., leave New York 4.30 p. m., 25 hours . . .	3
Penna. leave New York 10 a. m., 24 hours	4

TECHNICAL.

Manufacturing and Business.

Mayor Latrobe and Mr. Charles T. Crane, receivers of the South Baltimore Car Works, have been directed by the court to pay to the creditors a dividend of 25 per cent. and interest. The dividend amounts to about \$66,000, and is the third paid thus far, making a total of 75 per cent. received by the creditors. It is the expectation of the receivers to pay a final dividend of 25 per cent. in December.

John R. Saylor and Richard Stillman, of Philadelphia, have purchased ground along the Reading Railroad, in Pottstown, Pa., for the erection of machine works.

The Union Switch & Signal Co. has retired \$30,000 more of the first mortgage bonds of the company due to expire next March. This completes the \$60,000 due at that time, \$30,000 of which were retired last spring. The bonded indebtedness of the company has been reduced from \$300,000 to \$240,000.

The Ellwood, Pa., shafting and tube plant has been sold to capitalists headed by H. A. Lozier, of Cleveland. The new Board of Directors elected F. W. Ensworth, of New York, President; H. W. Hartman, Vice-President, and H. A. Paul, Treasurer. The purchase price is said to be very near \$100,000.

The plant of the Cleveland Foundry Co. was burned Oct. 10, entailing a loss of \$100,000.

The B. E. Tilden Co., of Chicago, reports a very satisfactory demand for its railroad car and locomotive replacing frogs and bridge guards. A large market for the device has been developed in South and Central America.

The Cleveland Twist Drill Co. has received an award of a gold medal from the officers of the Antwerp Exposition, Belgium, for its exhibit of tools.

F. G. Kretschmer has established an office at Room 503, 136 Liberty street, New York City, as the agent of the Brown & Sharpe Mfg. Co., of Providence, R. I.

The Hinckley brake slack adjuster, made by the Hinckley Brake Co., of Trenton, N. J., has been ordered for 100 box cars for the Delaware & Hudson Canal Co. now building by the Jackson & Woodin Mfg. Co.

The Berlin Bridge Co. is now operating its plant at East Berlin on night work. It has recently greatly increased the number of men employed and the present force numbers nearly 1,000 employees.

The immense shops of the Westinghouse Electrical Manufacturing Co., at Brinton, Pa., near Pittsburgh, are now completed and the company is prepared to do all its manufacturing work at that plant where the facilities for rapid and economical manufacture are in every way adequate. The machine shop at Brinton undoubtedly is the largest machine shop in the world devoted to the manufacture of electrical appliances. Part of the machinery in the factory at Newark, N. J., which employs 900 men has been removed to Brinton and that factory and the shops at New York and other parts of the country, will also be vacated and all the work done at Brinton, where it is expected that 4,000 men will soon be at work.

The Coe Brass Mfg. Co., of Torrington, Conn., is completing a new boiler house, to be equipped with boilers designed by the Bigelow Boiler Co. The coal will be handled from the storage to the boiler rooms by an equipment of narrow gage cars and track manufactured by the C. W. Hunt Co., 45 Broadway, New York City.

The Safety Car Wheel Co., of Detroit, has been incorporated in Michigan with \$500,000.

Iron and Steel.

The plant formerly operated by the Waukegan Iron & Steel Castings Co., of Waukegan, Ill., has been sold to the American Iron Car Brake Co.

The Midland Steel Co., of Muncie, Ind., has commenced the erection of another open hearth furnace. The company now operates one 20-gross-ton furnace.

The New Albany Forge and Rolling Mill, at New Albany, Ind., has been leased by Joseph Joseph & Brother, of Cincinnati, first mortgage bondholders. The lessees will immediately repair the plant and put it in operation. Josephus Norton will be the superintendent.

The Indiana Steel Casting Co., whose partly erected works at Frankton, Ind., were twice wrecked by wind storms, has closed a contract to locate the plant at Anderson, Ind. The company has an authorized capital stock of \$200,000. William Chambers is the manager.

The Shiffler Bridge Co., of Pittsburgh, Pa., has its plant running on fairly good time finishing up the contract for the Westinghouse Electric & Manufacturing Co., at Brinton. Work has also been commenced on the dry bottom and cupola houses for the Johnson Company at Lorain, O.

The Pittsburgh Bridge Co. has received a contract for an 800-ft. steel trestle for the Akron & Cuyahoga Falls Rapid Transit Co. Work has been begun on an addition to the plant of the Pittsburgh Locomotive & Car Works. This will be 187x67 ft., and will be of iron and steel. The new casting house for the Midvale Steel Co., at Nicetown, Philadelphia, is almost completed, for which the above company also has the contract.

The Scottsdale Iron & Steel Co., limited, has let a contract for the construction of a new foundry building to the Shiffler Bridge Co., of Pittsburgh. The new building will be entirely of iron, 50x100 ft., fitted with a Whiting cupola of large capacity, two large cranes and all other needed machinery.

The Reading Iron Co. has purchased the ground adjoining the Keystone furnaces in Reading, Pa., on which it proposes to build a rolling mill for the rolling of scrap iron. The plans are now being prepared.

At the Pennsylvania Steel Works the production of rails and Bessemer steel last week was the heaviest for years. The output of rails was 4,000 tons, the largest in the history of the establishment. The three furnaces in blast averaged during the week 500 tons a day. The company has received a contract of 1,000 tons of girder rails from the Chicago Street Railway Co., and also has a large order from Covington, Ky. The number of men employed at the works is nearly 4,000. During the week 210 car loads of rails were forwarded to the Bangor & Aroostook Railroad in Maine.

On application of J. B. Greenhut for a Receiver for the Iron Co., B. J. Greenhut, son of the complainant, has Peoria Steele & been appointed Receiver. The liabilities are placed at \$202,636, chiefly for loans due to J. B. Greenhut and G. J. Gibson, President of the iron and steel company.

The Bessemer steel works, blooming mill and billet mill of the Cambria Iron Co., Johnstown, Pa., started Oct. 14. This is the first work done on Sunday in these departments since the depression in business began, more than one year ago. On Oct. 15 the new rail mill began work on an order of large girder rails.

The American Structural Iron Co., incorporated some time ago under a West Virginia charter, by H. Sellers McKee, Mark W. Watson and Murray Verner, will locate its plant for the manufacture of structural material, etc., at Tonawanda, eight miles north of Buffalo and 10 miles from the power plant of the Cataract Power Co., which has contracted to furnish the plant with electrical power. E. M. Butz, a Pittsburg engineer, is the president and inventor of a process which will be used.

New Stations and Shops.

The new shops of the Rio Grande Western at Ogden, Utah, will not be completed this year as intended when the erection of the buildings was commenced. These shops were commenced in April, 1893, and in order to secure a bonus offered by the city of Ogden, the structures were to be completed by Oct. 17 of this year. Work was suspended in July last year, but the Rio Grande Western officers have obtained from the people of Ogden one more year in which to complete the shops to secure the bonus.

The Louisville, Evansville & St. Louis Air Line announces that the contracts have actually been let for the company's new freight and passenger station at East St. Louis. The new station will be situated at the Broadway viaduct, nearly a mile north of the yards now in use, and almost in the center of the city. It will be a brick structure, 45 ft. x 200 ft. The cost of the building, apart from the value of land, will be about \$40,000.

The Pennsylvania Company, operating the Pittsburgh, Wheeling & Kentucky Railroad has about completed the retaining wall for the new passenger station and office building at Wheeling, W. Va., which is to cost \$50,000. Owing to the lateness of the season and the litigation which has been necessary to secure the ground, the building of the station will be postponed till next spring. The contracts have been let, however, and the winter will be spent in making all preparations possible.

Air Brake Decision.

In the suit of the Westinghouse Air Brake Co., of Pittsburgh, against the New York Air Brake Co., the Circuit Court of Appeals has just handed down a decision holding that the quick-action triple valves of the New York Air Brake Co., are an infringement of the Westinghouse patent No. 376,837, which patent, because of the pioneer character of the invention, is entitled to the broadest possible construction. Bill on patent No. 448,827 is dismissed, because patent No. 376,837 fully covers the entire invention, including the modification described in the later patent.

THE SCRAP HEAP.

Notes.

The shops of the Delaware, Lackawanna & Western Railroad at Dover, N. J., have been put on full time.

The General Manager of the Northern Pacific has issued an order notifying employees that if they actively

participate in politics they must resign their positions on the road. A local newspaper, reporting this fact, says that over 30 railroad men have been nominated for public office in Minnesota lately; but whether all these belong on the Northern Pacific is not stated.

Press despatches from Pittsburg, Pa., report that indictments have been found against Mr. C. S. Wight, of the Baltimore & Ohio, for illegally granting rebates on freight bills. The complainant is an agent of the Interstate Commerce Commission.

Some weeks ago the City of Joliet, Ill., proceeded to tear up some of the side tracks of the Atchison Road, alleging that they obstructed certain streets. The Receivers of the road promptly had the Mayor and other officials arrested for contempt of court. Judge Grosscup, sitting in the United States District Court at Chicago, allowed the officials to preserve their dignity by letting them off with a reprimand and a caution to let the property alone until he had time to determine the rights of the city in the matter. The officials of the road think the action of the city due to ill-will on account of the track elevation trouble.

At Ogden, Utah, last week, two men who tried to wreck a train during the Debs strike were sentenced to 12 years' imprisonment, each, and a third one for four years.

W. E. McDaniel, the informer who told the officers of the Atchison, Topeka & Santa Fe beforehand about the attempt at train robbery near Gorin, Mo., last month, has been arrested on charge of complicity in the crime and has been bound over for trial.

A press despatch from Indianapolis states that Mr. F. G. Darlington, Superintendent of the Pittsburg, Cincinnati, Chicago & St. Louis, has been arrested on a charge of blacklisting two men who left the road at the time of the strike.

A Great Boiler Explosion.

Twenty-seven boilers out of a battery of 36 at the Henry Clay Colliery, Shamokin, Pa., exploded on the morning of Oct. 11. Five men were killed, two seriously injured and four slightly. The nine remaining boilers of the battery were wrecked, although they did not explode.

Locomotive Boiler Explosion.

On the afternoon of Oct. 12, a locomotive boiler exploded on the Morris & Essex Division of the Delaware, Lackawanna & Western Railroad at Glen Ridge Station. The engine, No. 126, was attached to a passenger train, and the explosion occurred just as the train had stopped at the station. The fireman received injuries from which he died within a few hours. The engineman was bruised and scalded severely, and has since died. The fire in the firebox was put out by the water escaping from the boiler.

South American Notes.

The Assembly of the Department of Cauca, Colombia, has approved a proposition of the general Government declining to extend the time of the concession under which Mr. W. L. Cherry was constructing the Cauca Valley Railroad, from Buenaventura to Cali. This work was in charge of an American company, with general offices in New York.

The project for a grand central railroad station in Buenos Ayres has again been taken up, and Messrs. Lavallo & Co. have made a definite proposition to the Government to build it for \$1,000,000 gold, within three years. The company asks to operate it for 30 years for its own benefit, all charges being subject to Government approval.

Messrs. Roldau & Kiernan have submitted to the La Plata Government, Argentina, a proposal to construct a network of narrow-gauge railroads in that Province to serve the needs of the agricultural districts. The plan proposes eight sections in all, connecting 40 principal towns. It is reported that the railroad from Antofagasta to Aguas Blancas, Chile, will be commenced at once.

The Chilean Minister of Public Works has approved a resolution of the State Railroads Council allowing private persons to run their own freight cars on the State railroads. The railroads will load, clean, and oil the cars, and will make good any damage caused by negligence of employees. Damages from unavoidable accidents will be repaired in the shops of the railroads, at the owner's expense. The owners of cars will be entitled to a reduction of 25 per cent. on tariff rates. Sidings into private properties must be put in at the cost of parties desiring them. All private owned cars are required to be built according to plans approved by the railroads.

The new railroad from Valdivia to Pichirapulli, Chile, has been opened to traffic.

The last report of Don Enrique Budge, Director-General of the Chilean railroads—who, by the way, has lately been removed from office—states that the National railroads of Chile up to the 31st of December, 1893, had involved an outlay of \$64,289,727, being an increase in the capital account of over \$4,000,000 since 1892. This does not include the outlay of \$13,080,832 on the Curicó & Angol, Talcahuana, Angol & Traiguén, Renaco & Victoria, Huasco, Melipilla, Puenco & Alcones lines, the accounts of which had not been officially liquidated. This makes a total of \$77,370,559. The traffic receipts for the year are given at \$12,631,982, and from other sources \$919,301, the increase over receipts for 1892 being \$3,427,797. The total expenditures were \$9,684,388, leaving a net profit of \$2,947,593. The number of passengers carried was 4,866,842, with a train kilometrage of 202,525,861. The income from freight traffic was \$7,964,107. The freight moved was 10,033,443 tons, with an average haul of 197 miles.

Indian Railroad Bridges.

No practical beginning has yet been made in the direction of renewing the weak girder bridges of the Bombay, Baroda & Central India Railway, but it is understood that the Board of Directors are preparing to send out 100 spans of a new type of 60-foot girders. The total number of spans to be replaced, however, is over 700. The company evidently want to gain time, and they have had recourse to the expedient of throwing the burden of suggesting a new design on the Government Consulting Engineer at Bombay. That exalted personage just now is Major Selby, R. E. The company are also suggesting that on parts of the line which must be doubled at an early date it would be better to put up the second line with new girders, diverting the traffic on to it, and leaving the old girders to be replaced when the work of doubling through is taken in hand.—*Indian Engineering.*

The reader who is interested to know the significance of this information, should turn back to the *Railroad Gazette* of Sept. 28, wherein he will find a letter from a chief engineer of an Indian railroad, and an editorial note that will enlighten him somewhat.

A Pass Forger on the Northwestern.

We have the following letter from the General Manager of the Chicago & Northwestern: "Will you kindly give prominence, through the medium of your paper, to the fact that a party by the name of F. Donohue is in possession of a forged letter, written on the letter paper of this Company from the office of the Superintendent of its Wisconsin Division and signed by W. A. Gardner, Superintendent; through the medium of which the said Donohue is endeavoring to secure railroad transportation. The letter is a forgery."

Two Train Robberies.

On the evening of Oct. 11 a through passenger train on the Southern Pacific was stopped by robbers about 6 miles west of Sacramento, Cal., and the express car robbed of bags of gold and silver said to contain about \$51,000. The robbers intimidated a track-walker and compelled him to go away, before they stopped the train. They induced the express messenger to open the car door by threatening to kill the engineman. The bags of money being very heavy they put them on the engine, cut it off and ran forward some distance. Then after getting off they started the engine back to the train with no one upon it, and it collided with the forward car, though without doing much damage.

On the same night, Oct. 11, about 9 o'clock, a north bound passenger train of the Richmond, Fredericksburg & Potomac was stopped at Aquia Creek near Quantico, Va., 34 miles south of Washington, D. C., by robbers who blew open the safe in the express car and took, it is said more than \$25,000. After securing their booty the robbers took the engine and ran some distance ahead and then turned it loose so that it ran at high speed to Quantico, where it would have struck a loaded passenger train but for the alertness of a switch tender, who saw it coming and quickly threw a switch, turning the engine upon a coal trestle.

There is no clue to the robbers in either of these cases. At Sacramento a large territory is being guarded, on the supposition that the treasure must have been hidden. At Quantico it is supposed that the robbers escaped by means of a boat on the Potomac River.

Guatemala Northern Railroad.

The contract for the construction of the Guatemala Northern Railroad is reported to have been let. The road is to connect the City of Guatemala with Port Barrios on the Pacific Coast, a distance of 160 miles.

A County Building for Chicago.

A proposition has been made by the George A. Fuller Co., of Chicago, to the Board of Commissioners of Cook County, to erect a new county building on the site now occupied, after plans submitted by Henry Ives Cobb, designer of the Fisheries Building at the World's Fair. The property has a frontage of 381 ft. on Clark street and extends back on Randolph and Washington streets half way to La Salle street. The specifications provide for a 14-story building, the cost to be \$4,832,000, payable in 4 per cent. 20-year gold bonds. It is assumed that this will afford enough space for all the court rooms and county offices and leave several floors for rent, which it is estimated will yield an income of \$400,000 a year. The company agrees to complete the work within two years and to furnish free of rent suitable quarters for the county officers. The proposition has been favorably received and resolutions adopted by the Commissioners providing for advertisements for proposals to erect such a building.

LOCOMOTIVE BUILDING.

The Southern Railway Co. has divided its order for locomotives between the Richmond and the Rhode Island Works. The latter secured an order for three switching locomotives and the Richmond Works an order for eight. They are all to be six-wheel switching locomotives.

CAR BUILDING.

The Philadelphia Electric Traction Co. has increased its order for cars from the Jackson & Sharp Co., Wilmington, Del., to 100. About 35 cars have been completed.

The Lebanon Mfg. Co., of Lebanon, Pa., completed the shipment of 150 cars on its contract, to the Lehigh Valley Railroad Co., lessees, the cars being owned by the E. P. Miller Trust Co. The company is filling a contract for the Cuban molasses cars.

BRIDGE BUILDING.

Baltimore, Md.—An important and interesting bridge is under construction in Baltimore. It carries the street known as North avenue over the ravine of Jones' Falls. The angle between the ravine and the street is about 45 degrees and the bluffs are about 60 ft. high where the street crosses. Below the bluffs are the tracks of the Northern Central and the Maryland Central, on either side of the stream, while on the top of the western bluff are the tracks of the Belt Line Railroad on the grade of North avenue. The bridge is to carry the street over this latter railroad as well as over the ravine. It is 100 ft. 2 in. wide by 410 ft. long and consists of three skew arches of brick, spanning the stream, the Maryland Central and the Northern Central, and a girder span over the Belt Line. The bridge floor is on a grade in order to get the head room over the Belt Line tracks in the minimum distance.

Bethlehem, Pa.—The Town Council has appointed a committee to confer with representatives of the Allentown Traction Co. and a committee from the South Bethlehem Town Council, in reference to a location for a new bridge between the boroughs of Bethlehem and South Bethlehem.

Charleston, W. Va.—The County Court of Kanawha County, met here last week, and let the contract for the new steel bridge across Canin Creek, at Coalburg, to the Detroit Bridge & Iron Works, of Detroit, Mich., for \$9,800, complete. The work is to be completed by February next.

Cleveland, Lorain & Wheeling.—The company has commenced the work of replacing 50 of the bridges on the lower end of its line with modern steel structures. Hallock Bros., of Wheeling, W. Va., who have the contract for the changes necessary in the stone work at the

various points began work last week on the second bridge beyond Bridgeport, and will continue till all the foundations are placed in readiness for the new bridges. The bridges are now building, and will be erected during the winter, the contracts calling for no interruption of travel while the work is going on. Several of the old bridges will be used in the construction of a new bridge over the Tuscarawas River at Goshen mines, for a spur-track.

Denver, Col.—The Board of Works has ordered the engineer to prepare plans for the new bridge at Thirty-eighth street. When they are completed bids will be asked for.

Easton, Pa.—The Delaware Bridge Co. has approved the plans for its new cantilever bridge across the Delaware River, between Easton and Phillipsburg. The two towers, each 60 ft. high, resting upon piers of new masonry, will weigh, it is estimated, 40 tons each. The bridge will consist of two shore or anchor spans, each 125 ft. long, and a river or centre span 300 ft. long. Total length of bridge, 550 ft. The plans call for bids on an 80-ft. and 64-ft. bridge. Eighty feet is the width of Northampton street.

Homestead, Pa.—Acting Secretary of War Schofield has approved the plans for the new bridge to span the Manongahela River at Dickinson street, and the Braddock & Homestead Co. will shortly begin its construction.

Oak Hill, Conn.—A new iron bridge is to be built at this place by the Town Board.

Somerset, Pa.—The reports of receivers recommending the erection of county bridges over Smith's Run in Mifflin Township, and over Raven Creek, in Benton Township, have been confirmed by the court.

Standfordville, Conn.—The Philadelphia, Reading & New England Railroad will soon begin construction of a new iron bridge at Standfordville, over the Black Creek at that Point.

St. Stephens, N. B.—Work on the stone approaches for the new bridge is nearing completion. The stone retaining walls at the St. Stephen end will be complete this week. A wall 75 ft. long forms the western side and one 37 ft. long forms the southern side of the enclosure, which is being filled with stone. These walls are 10 ft. wide at the bottom and 6 ft. on the top. The Calais approach will be completed in 10 days, when work on the iron super-structure will commence.

Williamsport, Pa.—The Groton Bridge Co. has been given the contract to rebuild the Maynard street bridge at its bid of \$17,900. Other bidders were Toledo Bridge Co., \$18,700; Penna Bridge Co., \$19,250; Massillon (O.) Bridge Co., \$18,000; Dean & Westbrook, New York, \$19,000; Nelson & Buchanan, Chambersburg, Pa., \$18,750; Horseheads Bridge Co., \$18,600; Owego Bridge Co., \$18,000; Berlin Bridge Co., \$19,250.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Long Island, quarterly, 1 per cent., payable Nov. 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Atchison, Topeka & Santa Fe, annual, Topeka, Kan., Oct. 25.

Central Massachusetts, annual, Boston, Mass., Oct. 31.

Chesapeake & Ohio, annual, Richmond, Va., Oct. 23.

Cleveland, Cincinnati, Chicago & St. Louis, annual, Cincinnati, O., Oct. 31.

Illinois Central, annual, Chicago, Ill., Oct. 17.

Manhattan Elevated, annual, New York City, Nov. 14.

Manitou & Pike's Peak, annual, Manitou, Colo., Oct. 20.

New Orleans & Northeastern, annual, New Orleans, La., Nov. 7.

St. Louis & San Francisco, annual, St. Louis, Mo., Oct. 23.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Wednesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the fourth Wednesday of January, March, April, September and October, at 10 a. m. At the October meeting Mr. Morford's paper on "Terminal Yards" will be the opening subject for discussion.

The *Southern and Southwestern Railway Club* meet at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Northwestern Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station, on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Western Society of Engineers* meets on the first Wednesday in each month, at 8 p. m. The headquarters of the society are at 51 Lakeside Building, Chicago.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds informal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, 36 Bromfield street, Boston, on the third Wednesday in each month, at 7.30 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The As-

sociation headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' Society of Western Pennsylvania* meets in the Carnegie Library Building, Allegheny, Pa., on the third Tuesday in each month, at 7.30 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month, at 7.30 p. m. Address P. O. Box 333.

The *Foundrymen's Association* meets at the Manufacturers' Club, Philadelphia, Pa., on the first Wednesday in each month.

The *Western Foundrymen's Association* meets in room 701, Western Union Building, Chicago, on the third Wednesday of each month. B. W. Gardner, Monadnock Block, Chicago, is secretary of the association.

Engineers' Club of St. Louis.

At the meeting of October 3, there were twenty-one members and eight visitors present.

Mr. N. W. Bayis gave an informal talk on the power house of the New Union Station, located about 1,800 feet south of the head house. The steam plant consists of four 250 horse-power Babcock & Wilcox boilers, set with revolving chain grates. The latter cost \$1,000 per boiler, and had proved entirely satisfactory, particularly in abating the smoke. The steam is used to operate three Buckeye tandem compound engines and two air compressors. The engines are direct connected to Siemens-Halske generators, which operate at 500 volts, and whose output is distributed by the five-wire system, permitting the operation of both arc and incandescent lamps. The compressors furnish air for the interlocking plant, which is the largest in the country, and with which 240 train movements were recently made in a single hour. The station is heated from this plant, the pipes being laid in a conduit about 1,800 feet long. The indirect system is used in the main building. Air is taken in at the top of the tower by two fans in the sub-cellar, and passed over steam coils. Each fan is driven by a 40-horse power motor. Direct radiation is used in the offices.

Mr. J. A. Laird presented the results of some experiments recently conducted by the Water Department to determine the efficiency of various forms of steam pipe covering. Chemical analysis was first made of each covering. Tests were then made—first, by noting the condensation per hour in a 10-foot length of 1-inch pipe, to which the covering had been applied $\frac{1}{4}$ inch thick; and, second, by filling the same pipe with steam, and after closing all valves, noting the time which elapsed before the pressure gauge fell to zero. The first test resulted as follows:

	Cubic Centimetres.
Magnesia, plastic.....	334
" sectional.....	335
Asbestos fire felt.....	367
" sponge moulded.....	371.3
Plaster paris and sawdust.....	438
Asbestos sponge cement.....	604.5
The bare pipe.....	1,085

The second test confirmed these figures. The initial steam pressure was thirty pounds.

Prof. Kinealy called attention to the fact that these experiments agreed well with previous investigations, which had shown that the best covering reduced the condensation to about one-third that in the bare pipe.

Northwest Railroad Club.

The first meeting after the summer vacation was held at the Ryan Hotel, St. Paul, on Oct. 9. The following members were elected: S. F. Forbes, Tracy Lyon, John Tong, F. W. Williams and H. Vaughan. F. B. Farmer, Northwestern Agent of the American Brake Co., read an able paper on "Piston Travel on Cars; Relative Merit of Long and Short Travel." The paper was discussed at length. T. A. Fague, M. E., engineer of tests of the "Soo" line made a report on the efficiency of compound locomotives as compared with the simple engines on the "Soo" line.

Canadian Society of Civil Engineers.

The Society of Civil Engineers resumed its fortnightly meetings at Montreal last week. A paper read for discussion was by D. A. Stewart, of Winnipeg, "Building railways across peat bogs or swamps."

American Society of Civil Engineers.

The final report from the Committee on Badges was read at the first meeting in October. By order of the Board, it was decided that hereafter the badge will be issued in two colors, blue and maroon—blue for corporate members, and maroon for all other members, except juniors, to whom hereafter no badge will be issued. Badges will be paid for by members on receiving them, but must be returned to the Society, if for any reason other than death the member ceases to be connected with it.

Ribbons will be provided at conventions and at other general gatherings, the blue and maroon as stated above, red for guests, and a white badge for juniors.

Certificates of membership will only be issued to members upon the condition of their being returned should their connection with the Society cease, except through death.

At the meeting of Oct 17 a paper was read by E. Sherman Gould, M. Am. Soc. C. E., on

THE DUNNING DAM, NEAR SCRANTON, PA.

of which the following is an abstract:

In 1886 the writer was engaged to design and build a storage reservoir of 350,000,000 gals. on Oak Run, a tributary to Roaring Brook, about 10 miles above the city, with an area above the reservoir of about $2\frac{1}{2}$ sq. miles.

The dam was completed and the reservoir filled inside of a year, with actual cost of \$65,393, about seven per cent. inside of the estimate. This reservoir was only a temporary expedient, and active steps were at once taken for building a larger one on the main stream. The topog-

raphy of the valley of Roaring Brook clearly indicated the best location for a high dam, and the exact position was determined by the use of an accurate contour map, which also furnished a ready means of calculating all subsequent excavations and embankments. Test pits were dug and a good idea of the ground obtained before beginning work.

The track of the Delaware, Lackawanna & Western Railroad followed the southerly bank of the brook through the greater part of its course, and at the side of the dam approached very near to the stream. On the northerly bank the Erie & Wyoming Railroad followed the course of the stream to where Oak Run joins it. The track then leaves Roaring Brook to follow the right bank of Oak Run, skirting along the reservoir.

At the site selected sandrock crops out on the southerly side, and continues to about the middle of the stream, where it breaks abruptly off. The remainder of the bed on the opposite side being mostly a stiff clay, the dam had to be built half on rock and half on earth, the transition point occurring near the center of the spillway. This abrupt breaking off was every unfavorable for securing a solid and uniform foundation, but the rock furnished a good foundation for the erection of the tower and gate chamber, and for the raceway and the discharge pipes, with a great saving of masonry. From the point where the rock broke off, a center wall of masonry was built, forming the core of the heavy earthen embankment.

The existence of two railroads presented a serious complication of the problem. In order to secure the desired capacity of 1,200,000,000 gals., it was necessary to raise the spillway 7 ft. above the Delaware, Lackawanna & Western Railroad track; it was impossible, therefore, to terminate the dam at the track, and the main dam had to be carried up to the necessary height and then a side wall built approximately parallel to the track for some 1,200 ft., or until the grade of the track was above the high-water level of the reservoir. A side wall was also necessary on the opposite bank about 600 ft. long, and as there was no suitable stopping place for it, it was turned across and under the track, and carried well into the solid bank on the other side.

The spillway of the dam has a total length of 152½ ft., and the flow line is 5 ft. below the crest of the dam. On the northerly side the masonry was carried 1 ft. higher, and the embankment 3½ ft. higher than the masonry on the southerly side, so that should some unprecedented freshet overpower the discharging capacity of the spillway, together with the blow-off pipes, the overflow would take place over the masonry rather than over the earthen embankment. The masonry was backed up to its full height by a heavy bank of earth; in other words, the inside embankment is continuous over the entire length of the dam, so in one sense it is an earthen dam with masonry spillway, etc. The writer strongly favors earthen backing for all masonry dams.

The sloping front of the spillway was stepped, rather than curved or battered. This is cheaper and prevents the water from obtaining a high velocity, by sweeping over an unobstructed surface.

The spillway during construction was repeatedly swept with floods. The effect was to excavate the bottom of the stream more or less in front of the dam. In constructing it, a timber crib filled with stone was placed at its lower limit. The bottom of the stream was leveled up with dry stone, the largest obtainable ones placed regularly on top. The joints were packed with spalls, and then a continuous bed of concrete about 1 ft. in thickness spread over the dry stone. On top of the concrete a stone masonry pavement was placed, consisting of heavy blocks bedded in cement mortar, and some additional dry stone rip-rap was placed below to protect it and regulate the channel, and there has been no perceptible wash.

The whole of the inside face of the dam was covered with an earthen embankment. This impedes leakage, and is equivalent to a deepening of the foundation on the water side. To establish communication between the water tower and the inside of the reservoir, an arched gallery was constructed, running through the bank with a small tower at the entrance of the gallery provided with a set of grooves for the insertion of frames containing vertical iron bars, 6 in. apart, to prevent objects from entering the pipes. These grooves could also be used for stop-planks, if desired.

The first 200 ft. of the side wall stood on rock foundation; above this it rested on earth, mostly clay and gravel. The danger was not that this wall would be overturned or moved outwardly, but that it should be thrown inwardly from the pressure of the earth against it when the reservoir was emptied. Weepers were, of course, inadmissible; a drain-pipe was placed outside of the wall parallel to it, to intercept as much as possible of the water and carry it below the dam. Much trouble was experienced from the caving of the bank during excavation. The whole area to be covered by the embankment should be cleared and grubbed before the work is begun. This operation was only partially carried out in the present instance, and caused much trouble and extra expense to the contractors.

On the south side the rock lay in flag-like slabs, about 2 ft. thick, with partings and bed filled with compact clay. In cutting into it a great deal was loosened outside of the neat lines, and it was found impossible to get down to anything more compact or less fissured in its structure; therefore, when enough of the surface rock had been removed to form a clean face, the work was built upon them, all irregularities being carefully packed with spalls, and care being taken not to disturb the natural beds. The total cost of the dam was \$312,429.

In clearing the reservoir site, all trees and stumps were cut as closely to the ground as possible, and the site of the embankment thoroughly grubbed and all sods removed, and the material ploughed up before placing the embankment upon it. The embankment was placed in layers as far as possible. The material was taken out with a shovel, carried to the foot of the bank in cars, and scraped into place by scrapers drawn by horses, also by wagons in the ordinary way. It was sprinkled while being put in, and the travel of the teams, men and scrapers was sufficient to compact it. The material was mostly clay and gravel loam. The stone used was mostly conglomerate. Perfect bedding and jointing of all stone with compact mortar was insisted upon, and at the beginning of the work stones were frequently raised, after being bedded, to see that all portions of their beds were in close contact with the mortar. In thick walls all beds were kept swimming.

PERSONAL.

—Mr. E. A. Young, a contractor, died in Elizabeth, N. J., Oct. 14, 65 years old. He built the long bridge over Newark Bay, between Elizabeth and Bergen Point, now owned by the Central Railroad of New Jersey. Mr. Young also constructed the wharves at Communipaw and at Claremont for the National Storage and Standard Oil

companies. He was Vice-President of the Elizabethport Banking Company.

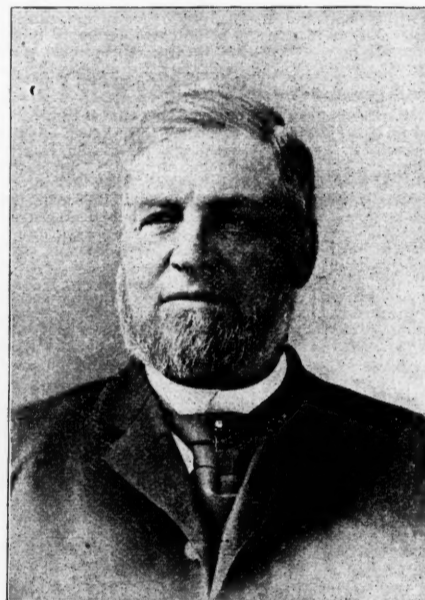
—Mr. Charles L. Sullivan, who was for several years the Superintendent of the Boyden Air-Brake Co., and who more recently held the same position with the Northwestern Equipment Co., has been appointed Mechanical Engineer of the Railroad Department of the National Malleable Castings Co., with headquarters in the Old Colony Building, Chicago.

—Mr. E. S. Bowen has been appointed General Manager of the South Carolina Georgia Railroad with office at Charleston, S. C. Mr. Bowen is one of the best known railroad men in the United States, his most recent service having been as Vice-President of the Erie, then General Manager of the Rome, Watertown & Ogdensburg, and later, Assistant to the President of the New York & New England.

—Mr. Victor Wierman, Assistant Engineer of the Pittsburgh Division of the Pennsylvania Railroad, has been appointed Superintendent of the Bedford Division of that road to fill the vacancy caused by the transfer of its former Superintendent, Mr. Frank Robb, to the Cambria & Clearfield Division. Mr. Wierman has been Assistant Engineer on the Pittsburgh Division since 1886. He has been connected with the Pennsylvania Railroad since he entered railroad work. He was first on the New York Division and became Supervisor there, being transferred afterwards to the West Pennsylvania Division as Assistant Engineer until 1886.

—Mr. G. G. Chandler, General Agent of the Northern Pacific road at Tacoma, Wash., was killed in an accident on an electric street railroad in that city on Oct. 6. Mr. Chandler became connected with the Northern Pacific in 1882 and for five years was Chief Clerk in the General Agent's office at Helena, Mont. In August, 1887, he was transferred to Tacoma as General Agent. In 1890 he was also appointed General Agent of the Puget Sound & Alaska Steamship Co. and occupied that position, together with the General Agency until Oct. 1, 1892, after which time the steamship company was operated by the Northern Pacific as a division of that company.

—The death of Mr. D. R. Sortwell was briefly noted in our last issue. Since then a correspondent has sent us the following fuller account, which will be of interest to those who knew Mr. Sortwell:



Daniel R. Sortwell.

Daniel R. Sortwell, who died at the Pavilion Hotel, Montpelier, Vt., on October 4, was born in Barton, Vt., July 10, 1820. During his boyhood he worked at home and attended the public schools of Orleans County, but at the age of 17 he started out to do battle on his own account. His belongings were packed in a small bundle and he worked his way to Boston by assisting a cattle drover, walking the entire distance. From this humble beginning, by his own unaided efforts, he worked his way by unflagging industry, economy and perseverance to the position he held at the time of his death, when he was reputed to be worth over \$2,000,000. From the time he arrived in Boston in 1837, he met with success on every hand. After several years of steady labor he entered the produce business in Faneuil Hall Market, Boston, and conducted a flourishing business. In 1860, he sold out his Faneuil Hall Market store and established the "Sortwell Distillery" in East Cambridge, Mass., at which place he was a long time resident. Later he became a stockholder in the Connecticut & Passumpsic Rivers Railroad, and through his connection with this road, became a bondholder in the Montpelier & Wells River at its inception. He was elected President of the road in January, 1877, and held that office at his death. Mr. Sortwell was the promoter of the Barre Branch, and the Barre Railroad, the latter being known as the "Sky Route" to the well-known Barre granite quarries. This road was commenced in July, 1888, and a length of five miles was completed in 1889. Mr. Sortwell took much interest in the construction of this road, and was chiefly instrumental in building the branch from Montpelier to Barre, so as to give the Barre Railroad direct connection with the Montpelier & Wells River. He was the largest stockholder in both the Barre and Barre Branch Railroads, and also owned nearly 98 per cent. of the capital stock of the Montpelier & Wells River, besides being a very large real estate owner at Barre. At the time of his death he was President of the Montpelier & Wells River Railroad, President of the Cambridge National Bank, Director and heaviest stockholder in the Cambridge (Mass.) Five-Cents Savings Bank, President of the American Investment Co. and President of the Columbus (S. C.) Water Power and Mill Co. Mr. Sortwell was well-known in New England railroad circles, where he will be greatly missed, and the citizens of Montpelier and Barre will long remember what he has done to build up those towns. The funeral was held on October 7, at his former residence, in East Cambridge, Mass., and was largely attended. Some 60 employees from the Montpelier & Wells River Railroad attended in a body, besides many near associates and acquaintances from Montpelier and Barre. The burial was at Mount Auburn Cemetery.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—Changes in the subdivisions of the Eastern Grand Division of the road are announced. The Panhandle Division will be abolished. The line from Wellington, Kan., to Panhandle, will be added to the Southern Kansas Division. The Augusta, Caldwell and Hunnewell branches will be included in the southern division. The McPherson and Little River branches will be transferred from the southern to the middle division. Superintendent J. L. Barnes will retain his position on the Southern Kansas, but will have charge of the extended territory. G. J. Hartman will remain as Superintendent at Wichita, and Avery Turner will have the McPherson branch added to his jurisdiction. The Rio Grande and New Mexico divisions of the Santa Fe will be consolidated, with E. Hurley, Superintendent, at Las Vegas, N. M.

Boston & Maine.—The annual meeting was held in Lawrence, Mass., on Oct. 10 and the following Directors were elected: Lucius Tuttle, Boston; Samuel C. Lawrence, Medford; Joseph Ricker, Portland, Me.; George M. Pullman, Chicago, Ill.; Richard Olney, Boston; William F. Hart, Boston; A. W. Sulloway, Franklin, N. H.; Joseph W. White, Brookline; Walter Hunnewell and Henry R. Reed, Boston; Aretas Blood, Manchester, N. H.; Lewis Cass Ledyard, New York; Henry M. Whitney, Brookline, Mass.; Henry F. Dimock, New York; William Whiting, Holyoke, Mass.; M. V. Edgerly, Springfield, Mass.

Central of New Jersey.—Norman E. Sprowl has been appointed Master Mechanic at the shops at Phillipsburg, N. J.

Chicago & Eastern Illinois.—R. D. Fowler has been appointed Superintendent of the main line in place of F. L. Corwin. Trainmaster H. B. Harper has been promoted to be Superintendent at Brazil, Ind., to succeed Mr. Fowler, and J. J. McLaughlin to succeed Mr. Laughlin as Trainmaster at Danville Junction, Ill.

Cincinnati, Lebanon & Northern.—George Hafer, Thomas J. Emery, George Bullock, J. F. Winslow, Joseph C. Thoms, Fred. C. Weir and S. M. Felton, Jr., have been elected Directors. Mr. Weir takes the place of Col. L. C. Weir, and Mr. Felton succeeds the late Theodore Cook. The Board elected Mr. George Hafer President and Treasurer, and J. F. Winslow, Secretary.

Cincinnati, Portsmouth & Virginia.—The annual meeting of the Company was held in Cincinnati last week, resulting in the election of the following Board of Directors: James G. Leiper, W. D. Frishmuth, Jr., Philadelphia; Thomas R. White, Jr., New York; J. S. L'Amoreaux, Ballston Spa, N. Y.; Samuel Hunt, George W. Lewis, Howard C. Hollister, John B. Keys, A. B. Voorheis, Cincinnati.

Cincinnati, New Orleans & Texas Pacific.—At the annual election in Cincinnati on Oct. 15, N. D. Woodford, Eugene Zimmerman, H. G. Shoemaker, Lawrence Maxwell, and Alfred Sully were elected Directors to represent Cincinnati, Hamilton & Dayton interests in the Board. There was no opposition, as the road was operated by the Receiver, and the control of the company can only be determined by the result of the foreclosure proceedings now pending.

Denver & Rio Grande.—At the annual meeting held in Denver, Colo., Oct. 16, the following Directors were elected: George Coppel, Richard T. Wilson, William Metens, Charles C. Beaman and Arthur Coppel, New York city; John Lowbre Welsh and Edmund Smith, Philadelphia; Edward T. Jeffery and Edward O. Wolcott, Denver.

Evansville & Terre Haute.—The following Directors were elected at the annual meeting held in Evansville, Ind., on Oct. 15: W. H. Tilford, Edward M. Gibbs, James Stillman, H. M. Tilford, Frederick Roosevelt, John L. Lamson, T. H. Wheeler, W. H. Curtiss, all of New York.

Flint & Pere Marquette.—J. H. Simpson has been appointed Assistant to the General Manager of the railroad, with headquarters at Saginaw, Mich.

Galeton & Coudersport.—The company has been organized in Pennsylvania by W. Dent, of Brookland, Pa.; H. C. Dornant, D. L. Raymond, J. Newton Peck, H. H. Cobb, Fred. J. Andrews, of Coudersport, Pa.; Austin Clinton, Galeton, Pa.; G. H. Fremain, Westfield, N. Y.; T. C. Platt, Albert H. Howe and George R. Sheldon, of New York.

Houston, East & West Texas.—S. C. Ray has been appointed Southeastern Freight and Passenger Agent of the Houston, East & West Texas and of the Houston & Shreveport railroads, with headquarters at Atlanta, Ga. The appointment takes effect Nov. 1. He was formerly Traveling Passenger Agent of the Queen & Crescent. Mr. Ray, has been with the Queen & Crescent for the past seven years, as Traveling Passenger Agent, with headquarters at Birmingham, Ala.

Jefferson & Allegheny.—The incorporators of this new Pennsylvania company are G. W. Childs, S. A. Rote, John G. Whitmore, J. N. Troxell, J. M. Grosch, J. H. Ralph, W. H. Holaday, all of Ridgway, Pa., and Adrian Iselin, Sr., Adrian Iselin, Jr., J. H. Hocart, Oscar Grisch and Columbus O. D. Iselin, of New York City. W. W. Ames, of Ridgway, is President.

Lehigh Valley.—B. A. Cunningham has been appointed Division Engineer, his jurisdiction extending from Manchester to Wilkes-Barre.

Louisville & Nashville.—The Directors of the Company have re-elected Milton H. Smith as President, and also a Director in place of J. A. Marcus, who resigned. It will be remembered that President Smith was left off of the ticket at the annual election last week, in order that a vacancy might be made for Mr. Albert Fink as a Director.

Northern Pacific.—The following is a copy of the circular issued by the receivers, creating the office of Comptroller:

The office of Comptroller to the Receivers of the Northern Pacific Railroad Company is hereby created, and Mr. John Scott is appointed Comptroller. He will be in full charge of the Treasury and Auditing Departments of the receivership, and all reports and communications to the Receivers from the Treasury and Auditing Departments, and all instructions from the Receivers on subjects connected with said departments, will be given through the Comptroller.

Rio Grande Southern.—The following have been elected Directors of the Rio Grande Southern: Otto Mears, E. T. Jeffery, J. W. Gillyly, Fred Walsen, John L. McNeil, Arthur Coppel, and Clarence Buckingham.

Seaboard Air Line.—H. P. Shoemaker has been appointed Soliciting Passenger Agent, with headquarters at 287 Broadway, New York.

Southern Pacific.—J. D. Begg, of the machinery department of the Columbus, Hocking Valley & Toledo, at Columbus, O., has been appointed Division Master Mechanic of the Southern Pacific, at Houston, Tex.

Southern.—E. F. Weld has been appointed General Storekeeper, with headquarters at Richmond, Va.

St. Paul & Duluth.—At the annual meeting of the Railroad in St. Paul last week, R. Somers Hayes, Thomas Denny, and W. R. Merriam were elected Directors for three years.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Beaver Meadow, Trescow & New Boston.—The branch railroad being built by A. S. Van Wickel under this title from a connection with the Central of New Jersey, near Beaver Meadow, has been completed for about 15 miles to Tamanend, Pa., and the road was opened for that distance last week. The line connects the most important collieries in the Beaver Meadow coal region and will give the Central of New Jersey a considerable traffic.

Blue Mountain.—The engineers have completed the survey on the branch road from Strausstown to Reading, Pa., and are now on the main line from Slatington to the Susquehanna, at Harrisburg.

Boyle & Sunflower River.—This railroad is to be constructed from Boyle, Miss., to Sunflower River, and track laying has recently been begun. The road is being built by the well-known lumber firm of L. V. Boyle & Co. of Chicago, and Boyle, Miss. Mr. C. E. Boyle is President of the new line.

Brady's Bend & Butler.—At a recent New York meeting of the company it was decided to begin operations at once. The road will start from the east side of the Allegheny River, and a railroad bridge across the river at East Brady, Pa., may be erected in the future. A tunnel will be cut through the hill near Kepple's Corners. The objective point is Oneida, on the Pittsburgh, Shenango & Lake Erie. The line will be about 15 miles long. The final survey has been finished by Engineer Richard Rowe, of Kaylor. J. M. Sullivan, a contractor in New York, and P. Moran, of Pittsburgh, have been looking over the ground.

Brook Cliffs.—Articles of incorporation were filed with the Secretary of State at Denver, Col., on October 14. The capital stock is \$50,000. The incorporators are: Charles P. Baxter, of St. Louis, Robert S. Morrison and E. De Soto of Denver. The road will be constructed from Crevasse siding on the Rio Grande Western, in Mesa County, a distance of 50 miles, to the Utah asphaltum beds. Its eastern terminus is but a few miles west of Grand Junction.

Buffalo & Susquehanna.—The extension of the road from Gaines to Ansonia, Pa., has been completed, and it is expected that the road will be ready for running through trains some day this week. The road makes a connection at Ansonia with the Fall Brook. It connects on the west with the Western New York & Pennsylvania at Keating Summit, and with the Addison & Pennsylvania at Gaines.

Buffalo, Attica & Arcade.—This company was incorporated in Albany, N. Y., this week, to construct a 30-mile railroad from Attica to Freedom. The capital is \$360,000. The Directors are Spencer S. Bullis, Olean; George W. Conklin, Attica; Clinton W. Merrick, Bradford, Pa.; Orrin P. Stockwell, Joseph A. Smith, Edward C. Hersch, all of Attica, and others. This company is a reorganization of the Attica & Freedom Railroad which is now being rebuilt by Mr. Bullis.

Butte, Anaconda & Montana.—Marcus Daly, of Anaconda, Mont., the principal owner of this railroad, has just completed a tour of Flathead country, in Western Montana. Mr. Daly, in a statement in regard to the trip, said that the object of his journey was to look up a route for the extension now building in that country. The road is already completed from Butte to Anaconda. Next summer a large force of men will be put on the work and it is hoped to have the road entirely completed in about two years. Mr. Ensign, the Chief Engineer, is still looking over possible routes through the Flathead country.

Central Counties.—Work is being pushed ahead on the extension of this railroad, and the line is now built from South Indian to Rockland, Ont., some 17½ miles. Five hundred men are engaged in its construction and some 100 teams.

Clearfield, Conemaugh & Western.—Chief Engineer Samuel Brugger is now surveying for two spurs, one of 1½ miles up Pine Run to the coke ovens, and another of about 3 miles along Alexander Run to Ramey, Pa., and connection with the Altoona & Phillipsburg connecting road. A contract for the construction of the first 33 miles, beginning near Porters' will be let in a few days. Hon. S. J. M. McConnell, of Harrisburg, Pa., is president.

Florence & Silver Cliff.—Hon. J. B. Orman, H. A. Sumner, Chief Engineer of the Florence, Cripple Creek & State Line Railroad; W. K. Johnson, of the Boston Land Co., and ex-Senator J. A. McCandless have recently made a three days' trip into Custer County, Col., viewing the route of the proposed new railroad from Florence to Silver Cliff. The party give encouraging reports of the route gone over and the rich mineral and agricultural country the road would open up.

Fort Plain & Richfield Spring.—The construction of this railroad has been going on for some time in Central New York. The grading is now nearing the village of Richfield Springs, which it is understood is to be the terminus of the road.

Galeton & Coudersport.—The company filed a charter at Harrisburg, Pa., on Oct. 15, to build a road from Galeton, Potter County, to Coudersport, Pa., about 26 miles. William Dent, of Brookland, Pa., is President. It will connect the Coudersport & Port Allegheny road with the Buffalo & Susquehanna.

Genesee & Wyoming Valley.—Chief Engineer P. H. Dewitt, of New York, with A. W. Dakin, as Assistant, has begun the surveying for the extension from Retsof to Caledonia, N. Y., where the line will connect with the various railroads centering there. The road will be constructed on the line of the old survey and pushed rapidly forward to completion. It is expected that trains will be running by January, 1895.

Jamestown & Lake Erie.—Articles of incorporation of the Company were filed with the Secretary of State at Albany, N. Y., last week. The Company is a reorganization of the old Chautauqua Lake Railroad. The capital stock is \$250,000, and the principal offices will be at Jamestown, N. Y. The Company will operate 25 miles of railroad from a point on the Dunkirk, Allegheny Valley & Pittsburgh Railroad, in the town of Ellicott, through Jamestown and on the easterly side of Chautauqua Lake to Mayville; thence on the westerly side of the lake to the grounds of the Chautauqua Assem-

bly Association, and also through the village of Westfield, crossing the Lake Shore Road to Barcelona on Lake Erie. The Directors are Henry W. Cannon, Stephen H. Voorhees, Sherman Everts, Hamilton H. Durand, Julius F. Workum, John J. Treacy, of New York City; William O. Jones, Brooklyn, and others.

Jefferson & Allegheny.—The company has been incorporated in Pennsylvania to build a road from a point on the Buffalo, Rochester & Pittsburgh, near Clayville, Jefferson County, to near Sharpsburg, Allegheny County, Pa. The length of the road will be 90 miles. The principal office will be at Ridgway, Pa. W. W. Ames, of Ridgway, is President. A number of the incorporators are Directors of the Buffalo, Rochester & Pittsburgh road.

Keystone & Northern.—This line is projected from Ellwood City, through Wayne and Slipperyrock Townships to Rose Point. Deeds for right of way through Beaver County were filed last week. The new road will connect with the Pittsburgh & Western at Ellwood City, and extend to Rose Point, and thence to Beaver. It will open up limestone quarries, coal mines and ore mines in the vicinity of Rose Point.

Minneapolis & St. Louis.—The Stockholders' Committee represented by Messrs. Bull, Strauss and Joline, of New York, purchased at sheriff's sale, on Oct. 11, for cash the entire road for the gross sum of \$5,010,000. Of this total, \$410,000 was bid for rolling stock, and \$4,600,000 was bid for the right of way and appertaining properties. The mortgagee and the Rock Island Road were represented, but made no opposing bids.

New Roads.—Edmund Hall proposes building a branch from the Flint & Pere Marquette Railroad to his timber lands in Gilmore township, Isabella County, Mich. The line would start from Farwell and run about three miles south.

The projectors of the railroad to extend from Granite Falls and Hartford Junction, a point on the Seattle, Lake Shore & Eastern, to Everett, Wash., are actively securing the right of way.

Pecos Valley.—The extension of the line from Eddy to Roswell, N. M., 80 miles, was completed into the latter town on Oct. 6. This extension, begun last April, gives the company a standard gage line 164 miles long from Pecos City on the Texas & Pacific up the Pecos River Valley to Roswell, the center of a farming and cattle growing district. This railroad is constructed by the Pecos Company, which, during the past five years has been building irrigation works in the Pecos Valley. A further description of the line is given in another column of this issue.

Pennsylvania.—The Common Council of Johnstown, Pa., has passed the ordinance granting the company permission to construct a single-track line from the main line over the city streets.

Quebec & Lake St. John.—The company has a charter to extend its railroad from Chicoutimi to St. Alphonse, Que., on Ha-Ha Bay. The residents of St. Alphonse are anxious that this extension, which is about 12 miles long, should be built next summer.

Roaring Creek & Charleston.—The work on this railroad now building in West Virginia, is going on under the direction of Samuel B. Diller, whose office is in the Penn Mutual Building, Philadelphia. The road is 16½ miles long and starts from a junction with the West Virginia Central & Pittsburgh, nine miles west of Elkins, W. Va., follows south up Roaring Creek and Flat Bush 12 miles to the Summit. Then down Cranberry and Casada Fork to Middle Fork River, 16½ miles in all. The road is to develop coal and timber lands and five miles of track has been laid and about 400 men are grading. This five-mile section is now being used and operated in hauling coal from the new mines owned by Mr. Diller at Womelsdorf, a new mining town, which has sprung up since the opening of the road.

Rumford Falls & Rangeley Lakes.—Ward Brothers, who were recently awarded the contract for the first 18 miles of this railroad, east of Rumford Falls, Me., have already started the work with a force of about 300 men. They expect by the end of the week to have at least 500 men on the clearing and grading. The construction work will be generally light. There are a few heavy cuttings, principally ledge work. The bridge work, as stated last week, includes one bridge 300 ft. long and another 100 ft. long, both of iron; several trestles, the largest being 400 ft. long and 34 ft. high and two wooden bridges each 80 ft. long. The road starts from Rumford Falls and crosses the Androscoggin River and follows up the valley of the Swift River, passing through the towns of Rumford, Mexico, Roxbury and Byron; then crossing to the head waters of the Bemis stream, it follows down the Bemis Valley to the Mooselookmeung Lake at Camp Bemis. The location surveys have been made over the first 18 miles and preliminary surveys for a few miles further. It is projected by Y. C. Brown of Bath, Me., who is its President, Edward Plummer and other Maine gentlemen interested in timber lands on the Swift River. The road will be narrow gage and is practically an extension of the Portland & Rumford Falls Railroad, in which many of the directors are interested.

San Antonio & Gulf Shore.—The officers state that track laying towards Velasco, Tex., from San Antonio, will begin this month and the first shipment of rails for 20 miles of the line will arrive at San Antonio this week. The Pittsburgh Locomotive Works are building several locomotives for the road. William Davis, of San Antonio, is President.

Santa Fe, Prescott & Phoenix.—Vice-President G. W. Vaughn reports that 1,200 men are now engaged by the company and the contractors in the construction work of this railroad south of Prescott. The railroad is in operation to that point from Ash Fork on the Atlantic & Pacific, a distance of 60 miles. The entire distance to Phoenix is 140 miles, and of this 70 miles has already been graded south of Prescott. The track has been laid from that town for over 45 miles.

Toronto, Hamilton & Buffalo.—The contract for the grading, trestles, culverts and masonry from the completed part near Brantford, Ont., to the site of the station at Hamilton has been let to Bracey Bros. & McNair, of Chicago, to be finished by Dec. 5. The grading, bridges, etc., are now about finished to Cainsville, five miles east of Brantford. The track is to be single from Brantford to Hamilton, and double from Hamilton to Welland. Hamilton has voted a bonus of \$225,000 to this railroad. W. R. Woodard of Brantford, Ont., is General Manager.

Waterville & Fairfield.—The firm of Lawrence, Newhall & Co., proprietors of lumber mills at Shawmut, have made a proposition to the owners of the railroad looking to its extension from Fairfield to Shawmut, Me. The firm agree, if the road is extended, to offer enough freight to pay interest on the cost of the extension. The distance would not be three miles. The Directors are considering the proposition of the firm and it is thought that the road will be built.

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—A complaint was filed in the United States Circuit Court in New York last week, on behalf of the Prescott & Arizona Central Railroad Co., and others, for \$8,250,000, against the Atchison, Topeka & Santa Fe Railroad. The complaint alleges that by contracts of the latter road in 1886 and in 1893 with the Atlantic & Pacific, the Prescott, Santa Fe & Phoenix, and other roads, the Prescott & Arizona was paralled and forced into bankruptcy.

Buffalo & Susquehanna.—A certificate has been filed at Harrisburg, Pa., officially completing the merger of the Coudersport & Wellsboro with the above company. The officers of the consolidated company are M. E. Olmsted, President and General Counsel, Harrisburg; F. H. Goodyear, Buffalo, Vice-President and Chairman of the Board; C. W. Goodyear, Buffalo, N. Y., Vice-President and General Manager; E. O. Cheney, Austin, Pa., Treasurer, and F. A. Lehr, Austin, Pa., Secretary. The capital stock is \$2,000,000, and it has an outstanding bonded indebtedness of \$900,000. The original Buffalo & Susquehanna extended from Keating Summit, in Potter County, west to Galeton, in the same county, about 60 miles, and the Coudersport & Wellsboro extended from Galeton to Ansonia, in Tioga County, about 13 miles; the consolidated road, therefore, is about 73 miles in length. At Keating Summit it connects with the Western New York & Pennsylvania, and at Ansonia with the Fall Brook system.

Cincinnati, Jackson & Mackinaw.—This railroad has passed into the hands of parties connected with the Lake Erie & Western and it will be operated in close connection with the latter. Messrs. Walston H. Brown & Co., the New York bankers, have sold their interest in the Cincinnati, Jackson & Mackinaw to a syndicate of which Samuel Thomas, Calvin S. Brice, John G. Moore, Nelson Robinson and others are members, and Messrs. W. H. Brown, George F. Stone, George C. Sheldon and Thomas F. Wadsworth have resigned from the directory. Their places have been filled by the above named gentlemen. Nelson Robinson was elected President, to succeed Mr. Brown, and George L. Bradbury, General Manager of the Lake Erie & Western, was elected Vice-President and placed in charge of the Mackinaw Road. The Mackinaw Company operates 346 miles of road, all of which it owns except 23 miles of trackage from Dundee, Mich., into Toledo. Its southern terminus is at the junction with the Big Four, 50 miles north of Cincinnati. The northern terminus is at Addison, Mich. A 20-mile branch to Jackson is contemplated. Certain of the above mentioned parties are interested also in the Louisville, New Albany and Chicago Railroad, which intersects the Lake Erie & Western at various points.

Cleveland, Akron & Columbus.—Judge Severns, of the United States Court at Cincinnati, has dissolved the injunction and dismissed the bill of the Amsterdam ex-directors of the Cleveland, Akron & Columbus, in which the ex-directors sought to restrain the issuance of a large sum in bonds as ordered by the present Directors.

Detroit, Bay City & Alpena.—Carrying out a decree of foreclosure the property of the railroad company is advertised for sale on Nov. 8 next. Bondholders who have not already deposited their bonds with Drexel, Morgan & Co., under the agreement of Dec. 1, 1892, are invited to do so before Oct. 25.

Duluth & Winnipeg.—Judge Sanborn, in the United States Circuit Court at St. Paul, on Oct. 12, appointed William F. Fitch, General Manager of the Duluth, South Shore & Atlantic road, Receiver of the Duluth & Winnipeg, pending the foreclosure of the mortgage. The action was brought by the Guaranty Trust & Safe Deposit Co., of Philadelphia, trustee, under the mortgage for \$2,000,000. The total amount of bonds authorized was \$7,000,000, and the issue of a further amount is enjoined. The Receivership also includes the North Star Construction Co., which built the road. The Duluth & Winnipeg has 150 miles built, from Duluth to the State boundary line. The interest on the bonds was defaulted in July last.

Junction.—The annual report of the railroad which is the connecting line between the Baltimore & Ohio and Pittsburgh & Western roads by a tunnel running from the Monongahela and Allegheny rivers, shows a decrease in all items, compared with 1893. Gross receipts were \$270,619, a decrease of \$31,076.35; operating expenses were \$67,536, decrease \$1,139; net receipts, \$283,083; decrease, \$19,646; interest, \$138,119; increase, \$1,914. Thomas M. King, of the Baltimore & O., was re-elected President.

Catawissa.—The company has executed a mortgage with the Pennsylvania Company for insurance on lives, and granting annuities, trustees, in the sum of \$500,000, dated Aug. 1 last. This mortgage is given to pay the Philadelphia & Reading road lessees, of the Catawissa Railroad for the construction of improvements to the latter's property, such as sidings and other new work. The bonds bear seven per cent. interest.

Kentucky Union.—On Nov. 1 the Kentucky Union Railroad, recently purchased by J. Kennedy Tod & Co., of New York, for \$1,000,000, will be transferred to the new company, which will be known as the Lexington & Eastern. The articles of incorporation for that company have been filed in Kentucky.

Lawrenceville.—The narrow gage road from Lawrenceville to Suwanee, Ga., 10 miles, has been abandoned by the Southern Railroad. The local stockholders are trying to arrange to operate the road. The majority of the stock and all the bonds are owned by the Southern Railway Co.

Lancaster & Reading Narrow Gage.—On Oct. 12 the company gave to the Lancaster Trust Co. a mortgage for \$350,000 and to guarantee an issue of five per cent. bonds.

Northern Pacific.—Judge Jenkins, of the United States Circuit Court of Milwaukee, has rendered his final decision confirming Thomas F. Oakes as Receiver of the Northern Pacific Railroad Co., and finally dismissing all of the charges against him. In its final decision the Court says that the charges against Mr. Oakes are unfounded in fact, and without support or evidence; that the investigation fully and completely exonerates him, and that the thorough and exhaustive investigation leaves his character for integrity without spot or blemish. The motion of the Ives party for the immediate institution of suits against former Directors is denied at this time the Court reserving that question for future consideration.

Philadelphia & Erie.—A recent decision of the Supreme Court in the case of the Philadelphia & Erie Railroad vs. the State, relieves the railroad of the payment of upwards of \$200,000 to the State as tax on its capital stock. According to the decision the company will not have to pay such tax until 6 per cent. revenue is derived from all money invested by it, the contention being that the company was exempt from taxation by

reason of its contract made with the State in a supplement to its charter, which provided for exemption from taxation until "6 per cent. revenue is derived from all money invested by it." In January, 1893, the Dauphin County Court held otherwise, and rendered a decision in favor of the State for \$26,850, with interest at 12 per cent. from March 9, 1893. This suit was for the tax on the capital stock for the year 1888. Prior to that time the State claimed about \$800,000 for taxes on the capital stock, which covered a period of 20 years. Suit was brought for the amount, but the claim was settled by compromise, the company paying the State about \$75,000. The tax for 1888 was then made the basis for a test case, with the result that the Supreme Court has now reversed the decision of the lower Court rendered in January, 1893.

Philadelphia & Reading.—The application of the Receivers for leave to pay the commissions contemplated in the Olcott-Earle plan and to enter into an agreement with the Reorganization Committee to unite with them in carrying out the plan came up for hearing before Judge Dallas in the United States Circuit Court at Philadelphia on Oct. 15. As objections were urged by lawyers representing various interests, Judge Dallas referred the matter to Special Master George L. Crawford. At the hearing before the Master John R. Dos Passos and Nathan Bijur spoke against the application.

Union Pacific.—The report of Master in Chancery Cornish on the petition of the Receivers for relief from the maintenance of unprofitable branches and obligations prior to the receivership, which has just been submitted to the Court, finds that these contracts are not binding, and advises that they be renounced, except that of the Rock Island and St. Paul roads, for the Omaha Bridge, and that with the Union Pacific, Denver & Gulf road, which petitions have been dismissed without prejudice, and the Northern Pacific Central over the Montana Union road, for which compromise is pending. All branch roads are found non-paying, but their operation is recommended, as they are necessary to the main line.

The financial statement for August is given in the following table:

Month of August:	1894.	1893.	Inc. or Dec.
Gross earn.....	\$2,266,429	\$2,092,161	I \$174,268
Oper. expen. (excl. taxes).....	1,480,524	1,397,188	I 83,336
Net earnings.....	\$785,905	\$694,973	I \$90,932
Eight months to Aug. 31:			
Gross earn.....	\$14,968,129	\$18,831,785	D \$3,863,656
Oper. expen. (excl. taxes).....	11,295,596	12,821,895	D 1,492,299
Net earn.....	\$3,638,533	\$6,009,890	D \$2,371,357
Oregon Short Line.—August:			
Gross earn.....	\$513,747	\$423,704	I \$90,043
Net earn.....	205,793	147,467	I 58,326
Eight months:			
Gross earn.....	\$3,193,100	\$4,103,161	D \$910,061
Net earn.....	893,481	1,540,125	D 646,644
St. Joseph & Grand Island.—August:			
Gross earn.....	\$75,467	\$78,534	D \$3,067
Net earn.....	24,628	23,462	I 1,166
Eight months:			
Gross earn.....	\$541,813	\$655,480	D \$113,667
Net earn.....	125,800	197,718	D 71,918

The earnings of the Oregon Railway & Navigation and Union Pacific, Denver & Gulf roads are excluded also the Denver, Leadville & Gunnison road, except for seven days of August.

TRAFFIC.

Traffic Notes.

The Northern Pacific Railroad Co. and its Receivers have appealed from the order of the Minnesota Railroad Commission reducing the rate on coal between Morehead and Duluth, from \$3. to \$2.25 per ton.

The meeting of General Managers held at Cincinnati last week, as usual failed to discover who was cutting the rates and the charges made by the Cincinnati, Hamilton & Dayton were referred to Commissioner Blanchard for investigation and report.

President A. A. Robinson of the Mexican Central says that the business outlook in Mexico is very encouraging and that the financial troubles existing in the United States have not spread to that country. The Mexican Central, and in fact all the railroads in Mexico, are doing much better than they have for years past.

The rate war that has existed between trans-atlantic steamship companies, whereby steamer rates were greatly reduced, has been renewed and now affects first-cabin rates. The usual fall reductions are greater than were ever made. The English companies placed their first cabin rate at \$60, which is the lowest rate ever made for that class of traffic, and \$15 below the usual winter rate of the German lines. To meet this reduction the North German Lloyd and the Hamburg-American Lines have announced that their first cabin passage rate for the winter months will be \$60 instead of \$75, as formerly.

The Cleveland Car Service Association has recently won an interesting law suit in the Summit County Circuit Court. A car load of lumber was shipped to the J. T. Seiberling Co., Akron, from Baltic. The car was placed on the tracks at Akron and remained there forty-eight hours. The Seiberling Co., asked the association to ascertain who the shipper of the car was. The agent telegraphed and received the information that "B. Arker," was the shipper, whereas the name should have been "Barker."

The company did not recognize the shipper and refused to accept the car until several other cars on the track had been unloaded. But the forty-eight hours had elapsed and more, too, and the association placed the goods in public storehouse.

This was in January, 1893, and the merchants at Akron held a meeting, raised \$1,000 fund to fight the case, and placed it in the Common Pleas Court as a test case. Judge Voris rendered a decision in favor of the Seiberling Co. The decision was so rendered because the merits of the rules and regulations of the car service company were not considered at the trial. The case was appealed to the Circuit Court and a decision rendered last week by Judge Hale in favor of the Car Service Association. He held that the contract which Barker made with the railroad company had in it conditions which justified the storage charges and the decision of the Common Pleas Court was reversed. Barker was the authorized agent of the Seiberling Co., at Baltic, and considered by Judge Hale as being a man competent to contract. The car load of lumber has been in the storehouse since first placed there, and may be taken out now by the owners when they pay the storage charges, which now amount to over \$500.—Cleveland Leader.

Philadelphia Car Service Association.

The fourth annual report of the Philadelphia Car Service Association for the fiscal year ended August 31, 1894, has just been issued. It shows that the total num-

ber of cars handled during the year was 1,063,143 against 1,346,369 for the preceding year. Of this number the Pennsylvania's Eastern system handled 508,770, or 47.57 per cent. of the total, while the Reading handled 465,017, or 43.74 per cent. The balance was handled by other companies, including the Baltimore & Ohio, 37,656 cars; Huntingdon & Broad Top, 4,365, and the Philadelphia Belt Line Railroad, 1,250 cars. The average detention to each car was 1.23 day on the Pennsylvania, 1.61 day on the Reading and 2.08 day on the Baltimore & Ohio. For all roads the average detention was 1.44 day, against 1.53 last year. The total cost of operating the association was \$27,636.66, against \$37,704.52 the preceding year. Total collections, \$45,635.65; last year, \$58,675.63, of which 45.46 per cent. came from the Pennsylvania, 50.10 from the Reading and 2.10 per cent. from the Baltimore & Ohio. Total refunds, \$6,509.10; last year, \$9,500.25. The cost per car for handling was 2.6 cent.; last year it was 2.8 cent.

Chicago Traffic Matters.

CHICAGO, Oct. 17, 1894.

East bound freight rates, especially on grain and provisions, are still being manipulated via the lower Mississippi crossings and fears are entertained that unless they are stopped the demoralization will involve the Chicago east bound agreement. Cuts of 10 cents and over are being made on provisions from Missouri River points, and export wheat is being taken from Kansas City to New Orleans and Newport News at 20 cents per 100 lbs.

The western roads are also beginning to feel the effects of the movement via St. Louis, and an effort is being made to correct matters at a meeting which is being held at St. Louis this week. Pending action at this meeting all lines have agreed to absolutely maintain rates. Yesterday the St. Louis meeting materially strengthened the agreement by the adoption of a report of a special committee on division of traffic and by passing a resolution to absolutely maintain rates. It is now believed that the result of the meeting will be to materially improve existing freight conditions. The meeting will take up to-day the subject of mileage on private cars, division of traffic and the issuance of passes for 1895.

Western lines have requested the coöperation of Central Traffic lines in meeting via Chicago the competition of the Soo line on second-class passengers from St. Paul to the seaboard. It is charged that the latter, by reductions from traffic and various concessions, is getting the bulk of this business.

The Illinois Central requests the Western Passenger Association for permission to quote via New Orleans the \$100 return passenger rate to San Francisco.

Another attempt was made last week, without success, to perfect a passenger agreement on east bound business from Chicago, Peoria and St. Louis.

Lake rates continue to slump and a rate of 1 cent a bushel has been reached on wheat to Buffalo. There is little expectation that rates will stiffen any before the close of navigation.

So far as known, prior to the finding of the Federal Grand Jury, no substantial progress has been made in securing evidence on which to convict any of the officials of the Atchison of the payment of rebates. The government is apparently depending largely upon the disclosures of one J. G. Taylor, formerly Live Stock Agent of the road under President Manvel, and who was subsequently discharged and is now apparently seeking revenge. In addition to Taylor, the Government has had before the Grand Jury Isaac Thompson, a cattle shipper of Kansas City, and Receiver Walker. Thompson, it is said, availed himself of the constitutional privilege and declined to testify. Receiver Walker authorizes the following statement:

"I have prepared for submission to the Grand Jury in answer to their subpoena a collection of papers showing the tariffs in force in 1892, and the number of carloads of live stock shipped by the party who is claimed to have received the rebate, but I have been utterly unable to find any vouchers for rebates of the character described in the subpoena deuces tecum. The most thorough search has been made, and I am confident that no such vouchers exist. There are no records showing that any such vouchers ever did exist. I expect and intend to answer fully any inquiry that may be submitted. It is evident, however, from such investigation as I have made that the proof of the actual payments of the rebates as alleged will have to be made from other sources, if at all, and I have been informed that the prosecution for this purpose are relying upon the statement of an employee of the live stock department, who was discharged some two years ago for cause."

The Western Passenger Association lines will join the Southern Pacific and Pacific Mail in meeting the Canadian Pacific's rate from New York to China on a pro-rate basis. At the same meeting it was voted that any agent of any line in the association may witness the signature in mileage books. No action was taken respecting the renewed demand of the Trunk Lines that western roads stop selling tickets in the Trunk Line territory.

East bound shipments fell off considerably last week, both of rail and lake. The collapse of the grain trade by lake threw a large number of boats on to the market, but the iron ore carrying trade showed considerable strength.

The shipments of east bound freight, not including live stock from Chicago, by all the lines for the week ending Oct. 13, amounted to 47,068 tons, against 54,000 tons during the preceding week, a decrease of 6,932 tons, and against 54,073 tons for the corresponding week last year. The proportions carried by each road were:

ROADS.	WEEK TO OCT. 13.		WEEK TO OCT. 6.	
	Tons.	p. c.	Tons.	p. c.
Michigan Central.....	2,665	5.7	3,806	7.1
Wabash.....	5,880	12.5	7,815	14.5
Lake Shore & Mich. South..	4,994	10.6	5,200	9.6
Pitts., Ft. Wayne & Chicago.	4,370	9.3	5,524	10.2
Pitts., Cin., Chi. & St. Louis	7,620	16.2	7,383	13.7
Baltimore & Ohio.....	3,900	8.3	4,136	7.6
Chicago & Grand Trunk....	3,545	7.5	6,086	11.3
New York, Chic. & St. Louis	5,642	12.0	5,491	10.1
Chicago & Erie.....	4,918	10.4	5,063	9.4
C. C. C. & St. Louis.....	3,534	7.5	3,496	6.5
Totals.....	47,068	100.0	54,000	100.0

Of the above shipments, 1,480 tons were flour, 15,305 tons grain and mill stuff, 7,504 tons cured meats, 12,446 tons dressed beef, 1,376 tons butter, 2,075 tons hides, and 4,506 tons lumber. The three Vanderbilt lines carried 28.3 per cent., the two Pennsylvania lines 25.5 per cent, Lake lines carried 50.855 tons, against 74,223 tons last week.